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VIEWS, NEWS AND INTERVIEWS.

Sarah Jane Rollason, of South Hampstead, London, has been granted a British patent for an improved slow speed dynamo.

The city council of St. Etienne, France, has decided upon a departure which will have an important effect on the silk and ribbon industries, both in Europe and in America. It has been resolved to apply electric motive power to all the hand looms in the city, and contracts have been made with an electric company for the necessary plant and supply. The number of looms is 18,000.

In an article in the current *Century*, Edmund Clarence Stedman writes about "What is Poetry?" and makes the following comparison:

"It is true that the poetic essence always has been a force, an energy, both subtle and compulsive; a primal force, like that energy the discovery of whose unities is the grand physical achievement of this century."

It is said that a very satisfactory filament for an incandescent lamp can be made from the root of the rice plant.

A despatch from London states that at a meeting of the committee on electrical display at the World's Fair, held there last week, and attended by Sir Henry Wood, head of the British commission, it was developed that there is every prospect that the British electrical interests will be adequately represented at the Fair. An especially good display of engines and dynamos will be made. It is probable that the rooms devoted to the exhibit will be lighted with electric furnishings of English style, which have proved to be a great attraction at the electrical exhibition now in progress in the Crystal Palace.

Ten thousand poles to be erected in the busy streets of the city! Over 100 highways to be invaded by the trolleys! Ninety miles of wire—death dealing, property destroying wire—to be strung before your doors! Citizens of Philadelphia, can you and will you stand this outrage?—*Philadelphia Inquirer.*

The man who invented the electric sprinkler would have a hearty welcome in this city if he would bring a lot of his patent prodders along. Possibly the friends of slow transit might object to being stirred up, but, in the interest of the public, they should be compelled to take the medicine.—*Philadelphia Times.*

Mrs. Leila Morse Rummel, daughter of the late Professor Morse, of telegraphic fame, has addressed a letter to the Joint Committee on Library protesting against the passage of the bill introduced by Senator McPherson for the purchase, for $10,000, from Stephen Vail, of New York city, of the original telegraphic recording receiver invented by his father, Alfred Vail, and used upon the first telegraph line ever constructed between Washington and Baltimore. She says that her father's claim to have been the sole inventor of the original telegraph instrument has been established by undoubted proof, and had been upheld by a decision of the United States Supreme Court, and she begs to be spared the necessity of fighting over again the battle that her father won in support of the originality of his invention.

A proposal has been made to the Canadian government with the view of it taking over the control of all the telegraphs in the country, as in England. Mr. F. N. Gisborne, the superintendent of the government telegraphs, has drawn up a report on the subject.

The Thomson-Houston International Electric Company has transferred its business in the following territory to the Union Elektricitats Gesellschaft: Germany, Austria-Hungary, European and Asiatic Russia, Finland, Sweden, Norway, Denmark, Holland, Belgium, Switzerland and Turkey. The former manager of the Hamburg office, Mr. Louis F. Magee, has been appointed technical director. The office of the new company is to be located at 32 Hollmannstrasse, Berlin, S. W., Germany. The management is in the hands of Louis F. Magee, Max Kosegarten and F. W. Vortmann.

An electrical engineer, who has recently had important confidential relations with the government of Mexico, says that the opportunities for an electrical engineer in that country are very flattering. The government is taking an active interest in all industrial, engineering and scientific matters, and the building of more industrial and technical schools and colleges is counted upon in the near future. The prime requisite for a successful career in Mexico, after ability, is a knowledge of the language, as the Mexicans are said to rival the Yankee in the shrewdness of their business transactions.

The Thomson-Houston Ribbon Feed Arc Lamp.

A new arc lamp, shown in the illustration on this page, has recently been perfected by the Thomson-Houston Electric Company for indoor lighting on either arc or incandescent circuits. It is but 27¼ inches from top to bottom, six inches wide, and weighs 21 pounds without the globe. The feeding and regulation are perfect, the arc being always the same length, perfectly steady, brilliant and free from hissing. The entire mechanism is carefully protected from dust and dirt. On arc circuits the lamps are run in series, and regulate and cut off automatically. On incandescent circuits they are run in multiple or two in series, a small rheostat or bank of incandescent lamps being used as a controlling device.

THOMSON-HOUSTON RIBBON FEED ARC LAMP.

At a meeting of the directors of the New England Telephone and Telegraph Company, held on Wednesday, March 23, a dividend of 75 cents per share was declared, payable on Saturday, May 14, 1892, to stockholders of record at the close of business on Thursday, March 31, 1892. The transfer book will be closed from Friday, April 1, to Monday, May 2, 1892, both days included.

Tesla's Experiments.

[*From London Electrical Engineer.*]

The French papers this week are full of Mr. Tesla and his brilliant experiments. No man in our age has achieved such a universal scientific reputation in a single stride as this gifted young electrical engineer. The *Nineteenth Century* contains an article by Mr. J. E. H. Gordon, introducing the subject to the literary world in admirable and brilliant style, reflecting both the scientific depth and the coruscations of the original experiments.

The Trolley Wins in Philadelphia.

Mayor Stuart, on March 31, vetoed the ordinances which went through the Philadelphia city councils giving the Philadelphia Traction Company permission to introduce the trolley system on many streets.

A mass meeting was held the previous Wednesday evening, in the Academy of Music, and a formal protest entered against the introduction of the trolley, and since then many thousands of citizens have signed a paper asking the Mayor to veto the ordinance.

On Monday the Mayor listened for six hours to arguments on both sides of the question. As soon as the Mayor sent in his veto to councils, on March 31, both branches passed the ordinance over it.

The Telephone Question.

Public interest in regard to legislative control of corporations has been aroused by the Telephone Commission bill introduced in the legislature through the efforts of Mr. Frank W. Gardiner, assistant secretary of the Board of Trade and Transportation. This measure provides that telephone rentals in cities of over 600,000 inhabitants should be regulated by a board of commissioners consisting of the Mayor, Comptroller and President of the Board of Aldermen. The question at issue is a very broad one, and cannot be confined to the telephone companies. The principle involved concerns street surface railroads, elevated railroads, telegraphic companies, gas companies, and all other corporations whose franchises and privileges, granted by the city or State, are of great pecuniary value to their possessors.

Public opinion very properly holds that certain legal restraints should be placed on charges made for service by corporations owning valuable franchises and privileges, and that the law-making power should insist that the service rendered should be as efficient as possible. The men who control the telephone service in this city have a reputation for honor and ability. They announce that they are ready at all times to enter into thorough discussion of methods and rates with their subscribers. They would be extremely short-sighted if they did not serve the public with fidelity and zeal, or if they should refuse to co-operate with their patrons in a fair consideration of the whole subject of service and rates.—*New York Press.*

The Telephone Hearing.

The hearing on the Malone bill to create a local commission in New York city and Brooklyn, to regulate telephone rates, was continued last week at Albany before the legislative committee on electricity, gas and water supply. Joseph H. Choate appeared for the Metropolitan Telephone Company. He said the company had 9,000 subscribers; 2,000 pay $240 a year for special service in having a metallic service and no one with them on their wire; 6,000 pay $150, with two on a wire, and 1,000 pay $84, with three on their wire. All received service every day in the week for 24 hours. In England service was only given during business hours, and cost 20 guineas, or little over $100. He challenged the opposition to produce one of the $240 subscribers who was dissatisfied. The dissatisfaction, if any existed, came from those who paid $84 and wanted a $240 service for it. For the first six years the company managed to pay a dividend of not over 7½ per cent., and the last two years had paid no dividend. It has cost to remove poles and comply with the law $1,000,000, and $200,000 to put new wires in the subways.

The supporters of the bill present were Thomas Barrett, of 78 Duane street, a paper manufacturer and a member of the Board of Trade and Transportation; Frank S. Gardner, secretary, and William McCarroll, president, of the American Leather Company.

Mr. Barrett said the bill was not to cut rates, but for a commission to investigate.

President McCarroll said there was no movement made against the company through malice. All companies should be made to give the best service possible at the lowest cost. He said he had been told by an agent of the company that he could not have the long distance service put in, except by paying $90 additional to put in what Mr. Choate had said cost only $50, and then was told that he had better put in the $240 service, as the cheaper would be cut out as soon as the subway metallic circuit had become necessary. When he decided to retain his old $150 telephone he could only renew his contract for one month. At the request of Chairman Martin, he agreed to send up his documentary evidence.

Assemblyman Roche practically closed the hearing by asking Mr. Gardner what was done with the $100 collected from each member of the telephone association who were pressing the bill. Mr. McCarroll answered for Gardner that it was all expended for printing and necessary expenses. Mr. Gardner said it would cost $500 to get the information asked for by the committee.

The Stilwell Patent Sustained.

In 1890 the Stilwell & Bierce Manufacturing Company, of Dayton, O., brought suit against S. N. Brown & Company, of Dayton, for infringing their patent in using a Hoppes live steam feed water purifier, manufactured and sold to them by the Hoppes Manufacturing Company, of Springfield, O. Judge Sage, sitting in the United States Circuit Court for the southern district of Ohio, western division, on March 12, decided the case in favor of the plaintiffs, and decreed an injunction and account with costs. The decree was entered March 19.

The defense was vigorously pushed by the defendant, but the victory is a broad one for the Stilwell & Bierce Manufacturing Company.

The Behavior of Insulating Materials Under the Action of High Potential Differences.*

BY H. BLECKEY BOURNE AND W. FOX BOURNE.

Electrical engineers have recently been devoting a great deal of attention to the transmission of energy by small currents at high pressures; and it is clearly advantageous to increase the potential difference until the expense of insulating the apparatus neutralizes the saving in copper. The question of insulation is, of course, the main difficulty, for as we increase the potential difference many substances which are ordinarily considered insulators have to be regarded as fairly good conductors. Numerous experiments were shown to illustrate this point, the current being obtained from a "Hedgehog" transformer capable of developing about 25 horse-power at 100,000 volts, which had been lent for the occasion by Messrs. Swinburne & Company.

The question of sparking distance in air does not seem to be of any great practical importance, but as it has recently been referred to, the following figures, obtained at Messrs. Swinburne's works, may be of interest:

SPARKING DISTANCES BETWEEN NEEDLES.

Potential differences in volts.	Sparking distance in inches.
3,000	0.11
14,900	0.5
24,000	1.0
39,000	1.6
50,000	2.2
62,000	2.8
74,000	3.5
92,000	4.5
97,000	5.0

SPARKING DISTANCES BETWEEN PLATES TWO AND ONE-HALF INCHES DIAMETER.

Potential distance in volts	Sparking distance in inches.
13,000	0.16
20,000	0.40
44,000	1.0
70,000	2.0
90,000	3.0
105,000	4.0

The above results were obtained on a cold, dry day, but can only be regarded as approximate, as the distance was found to vary a good deal with atmospheric and other conditions, so that concordant results could not alway be obtained on different days. By striking an arc between electrodes of tin wire, which gradually melted, a flame of considerable length was exhibited, and it was pointed out that the length to which an arc could be drawn depended very largely on the current strength available.

It was next shown that, for overhead work at very high pressures, even oil insulators of the best design are quite useless. Wires from the transformer were connected to the stalk and groove of an insulator which has been dried and filled with clean resin oil; brush discharges immediately occurred over the surface of the porcelain, and when a potential difference of 60,000 volts was reached a spark jumped from the wire to the stalk. Two wires were placed near the ends of a piece of slate about a yard long, and sparks passed freely from the wires to the slate; and a sort of arc lamp was arranged with slate pencils for electrodes. A similar conducting power was shown to be possessed by vulcanized fibre and asbestos millboard. The discharge does not break down or perforate these substances; they behave exactly like conductors. A curious effect was shown with a long piece of slightly damp wood; numerous small arcs being formed, which finally ignited the wood.

The experiment with the oil insulator and other experiments shown, point to the fact that surfaces of insulating materials, unless absolutely clean and dry, have considerable conducting power. A discharge may sometimes take place on the surface of a non-conductor across a distance much greater than the striking distance in air, and once a discharge has started an arc is formed. A cable insulated with a layer of rubber a foot thick might be useless for 50,000 or 100,000 volts, if it had even a small crack. This creeping discharge was also shown by the now familiar experiment in which a pair of disks are separated by a large sheet of glass. In one of the experiments shown the glass did not break, though the discharge passed through it; and it was found that if there ever had been a perforation, the heat of the arc had fused the glass and entirely sealed up the hole.

The potential difference required to break down or perforate insulators is quite a different matter from the discharge over their surfaces. A number of samples of broken down insulators were exhibited; they were materials which had been tried for use in condensers, and were in the form of thin sheets of mica, celluloid, paper impregnated with various resins and waxes, etc., and were about six mils thick; they had been perforated with potential differences varying from 2,000 to 6,000 volts. A piece of cable insulated with a layer of vulcanized rubber of the best quality, rather over one-eighth of an inch thick, was shown; it had withstood 50,000 volts for 25 minutes. In such cases the time element is of great importance, and the dielectric is usually found to become very hot before it breaks down. This fact indicates a very important difference between the effects of direct and alternating currents on insulators. Whenever, as in the case of a concentric cable, the two conductors are at all close together, we have a condenser which is being rapidly charged and discharged. Now, in the case of most solid dielectrics there is a good deal of soaking in, and consequent loss of energy, which manifests itself as heat. This was made very evident in the case of a condenser which was tried at Messrs. Swinburne's works. This condenser was made of sheets of tinfoil, insulated with paper soaked in paraffine wax in the usual way; its insulation, measured with a steady electromotive force of 240 volts, was about six megohms, and the active surface of plates was 5,000 square inches. When it was connected across a 2,000 volt circuit it was found to absorb more than a horse-power, so that a considerable rise of temperature was not surprising. But it was also noticed that its capacity rapidly diminished, and finally disappeared, which was, on investigation, found to be owing to the fact that the foil had melted, and so become disconnected from the circuit. Another condenser, made with glass plates one-tenth of an inch thick, broke down with 2,000 volts after about five minutes, apparently owing to internal cracks caused by the heat evolved. In the case of the sample of rubber covered wire above referred to, the compound in which the braiding had been soaked melted in five minutes, and the rubber became quite softened by the heat in about 15 minutes.

This heating effect is much less in the case of most fluid insulators, but seems to be more important in oils having a high specific induction capacity.

Some experiments were then arranged to show some actions of oils under high voltages. A plate was immersed in castor oil and a point supported a short distance above the surface. On switching on the transformer, a distinct depression was produced on the surface of the liquid. Two plates were then arranged, one over the other, separated by a layer of castor oil, on which was floated some paraffine. When the plates had a difference of potential of 20,000 or 30,000 volts, the castor oil rose in a sort of hill, owing to the fact that its specific inductive capacity is higher than that of paraffine, so that by its movement the capacity of the arrangement is increased. It was also shown that particles of sawdust in resin oil were formed into chains, producing a discharge across a considerable distance.

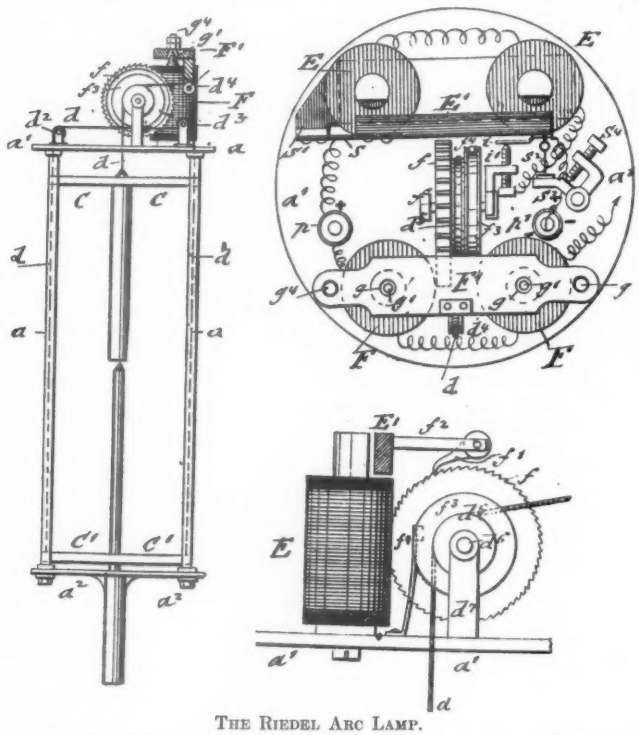
The experiments were concluded by sending the current from the transformer through a number of vacuum tubes. These were, of course, brilliantly illuminated, but the current was not maintained for more than a few seconds, as an intense heating of the glass and electrodes ensues, which usually break the tubes. This fact renders it difficult to measure the power absorbed, but it was estimated from the primary current and voltage that a comparatively small tube may easily be made to absorb about 2.5 horse-power, while giving a light of only a few candle-power.

In the above described experiments the potential differences were measured by a direct reading electrometer, kindly lent by Messrs. Swinburne & Company. This and the transformer are intended to be used for experiments to be shown by that firm at the Crystal Palace Exhibition.—*London Electrical Review.*

* Abstract of paper read on March 11, before the Old Students' Association of the City and Guilds of London Institute, at the Central Institute, South Kensington.

The Riedel Arc Lamp.

With a view to reducing the compass of an arc lamp so that it will occupy comparatively little vertical space and can be used to advantage in rooms having low ceilings, Mr. Josef Riedel, of Boston, has designed the lamp illustrated in the accompanying engraving. The carbons are mounted upon sliding supports, and, as they are consumed, are automatically fed toward each other. Both carbons being movable, the compass of the lamp can be largely reduced. The upper carbon is made about double the thickness of the lower carbon, so that the crater will act as a reflector and throw the light downward. As will be seen from the engraving, the lamp comprises a frame consisting of vertical bars *a a*, and cross pieces at the top and bottom. The vertical bars are grooved so that the carbon supports can slide up and down in them. They also form a hoisting for the cords *d*, of silk or other flexible material. The cords from the lower carbon carrier C^1 pass over fixed pulleys d^2 d^3 at the top of the lamp frame, and over a movable pulley d^4 mounted on the armature of an electro-magnet F, and thence over a pulley attached to a ratchet wheel. The magnet F is in the main circuit and, when the lamp is cut in, draws down the armature upon which the little pulley d^4 is mounted, and thus slackens the cord and permits the lower carbon to descend, thus springing the arc. There is also a shunt magnet, not shown in the left hand figure, but shown at E in the two right hand views, the armature of which is provided with a pawl operating on the ratchet wheel *f*. This armature carries a rheotomic circuit breaker analogous in its action to the rheotome of a Ruhmkorff coil. When the arc grows too long its increased resistance forces sufficient current through the shunt to attract the armature of the electro-magnet E, and thus throws the rheotome or circuit breaker into operation, and this slowly revolves the ratchet wheel *f* and produces a feed of the cord *d*, bringing the carbons closer together. The shunt magnet and its ratchet mechanism are illustrated in the lower right hand diagram. The mechanism illustrated in the engraving is provided with a neat cover, all of the operative parts are enclosed, and there is no projecting rack or carbon rod, as in most other types of arc lamps.



THE RIEDEL ARC LAMP.

Sending Catalogues.

The letter of Mr. Geo. B. Grant, on another page of this issue, shows again that there are two sides to almost every question, and that this matter of supplying catalogues upon request is no exception to the rule.

There is no doubt whatever that many catalogues are wasted, so far as any benefit to the manufacturer is concerned, but, on the other hand, there is no doubt that manufacturers frequently receive applications for catalogues written upon plain letter paper and signed by unfamiliar names, where it would pay well to send the catalogue as promptly as possible.

It frequently happens that young mechanics working together in a shop make up their minds to go into business. They naturally wish to get prices and all the information possible regarding tools and equipment generally. They write for catalogues upon plain paper, and nothing can be more certain than that their request should receive some attention in some form, and the worst possible thing that can be done with the letter is to throw it into the waste basket unanswered because it does not bear the printed letter-head of a business firm. It frequently happens, too, that mechanics who occupy leading positions in shops are endeavoring to have improved machinery put in for doing certain work. Before saying anything on the subject to their employer, they wish to investigate the matter fully for themselves, so that when it is presented to the employer it can be done in a complete manner, the relative merits and adaptabilities of the different machines on the market explained, their approximate cost given, and the degree of improvement that may reasonably be expected from the adoption of some one or more of them. Such men are very apt to write for information upon plain letter paper, or even postal cards, and no inquiries received by a manufacturer are better worthy of attention. The trouble is to distinguish between such inquiries as these and those of the mere collectors or idlers, who, as Mr. Grant says, are after everything that can be had for the asking.

And since it is usually impossible to distinguish, the question then becomes which course to adopt. To send to all alike a good catalogue or the poorest one that can be produced, to pay no attention to requests for catalogues not written on the letter-heads of business firms, or to charge a small price, sufficient to cover the cost of production and mailing. We are not prepared to say which of these plans is the best one, but we are prepared to say, without hesitation, which is the worst, and that is to send only to business firms, paying no attention to the others. Some firms adopt the plan of dividing their catalogues into a number of pamphlets, each treating of a separate line of machines. Thus when an inquiry comes in for a certain machine or line of machines, that particular pamphlet is sent at small expense, and the applicant gets what he wants, and is often better suited than he would be with a larger catalogue. Again, others adopt the plan of making their catalogues as small and inexpensive as possible, yet of good quality, and sending one in answer to every demand, without distinction. No one who has been much in machine shops can doubt that one firm, at least, gets a great deal of valuable advertising from the circumstance that its small and condensed catalogue is to be found in the tool chests of so many machinists, and that it is so frequently referred to in the shops when machine tools, gear wheels, etc., of which it treats are being discussed. This firm which we have in mind advertises that its catalogue will be sent to any address upon application. This is one plan, and in this case, at least, is found to work well. It might not work so well with others differently situated, and, in any event, the subject is one which is worth some attention. Any plan is better, however, in our opinion, than getting out poor and cheap catalogues, or ignoring requests for catalogues not written on letter-heads of business firms.—*American Machinist.*

Is It Loaded for B'ar?

A patent of considerable interest in the transmission of electrical energy by high tension currents was recently issued to Deprez and Carpentier with four broad method claims. The system consists essentially in making and breaking a battery current at the transmitting station and raising the interrupted current in tension by an induction coil, transmitting the high tension induced currents over the line, and then lowering the current by a corresponding induction coil at the receiving station. The claims of the patent are as follows:

"1. The improvement in the art of transmitting electrical energy to and utilizing it at a distance from the source, which consists in generating maintained and practically uniform currents of high tension at one station and sending the same over a line of conductors to another station, and generating maintained and practically uniform currents of lower tension at the second station by the inductive influence of the high tension currents, substantially as described.

"2. The improvement in the art of transmitting electrical energy to and utilizing it at a distance from the source, which consists in generating maintained and practically uniform currents of high tension at one station and sending the same over a line of conductors to another station, generating maintained and practically uniform currents of lower tension at the second station by the inductive influence of the high tension currents, and converting these maintained low tension currents into other forms of energy, such as heat, light, etc., substantially as described.

"3. The improvement in the art of transmitting electrical energy to and utilizing it at a distance from the source, which consists in generating maintained and practically uniform alternating currents of high tension at one station and sending the same over a line of conductors to another station, and generating maintained and practically uniform alternating currents of lower tension at the second station by the inductive influence of the high tension currents, substantially as described.

"4. The improvement in the art of transmitting electrical energy to and utilizing it at a distance from the source, which consists in generating maintained and practically uniform alternating currents of high tension at one station and sending the same over a line of conductors to another station, generating maintained and practically uniform alternating currents of lower tension at the second station by the inductive influence of the high tension currents and converting these maintained low tension alternating currents into other forms of energy, such as heat, light, etc., substantially as described."

There might be some question as to the scope of these claims by reason of the term "maintained and practically uniform currents." Inasmuch as a vibrating circuit interrupter produces distinct makes and breaks in the primary circuit of the tension raising coil, it is not seen how the high tension currents generated could be maintained currents in the sense of continuous currents. Upon the make of the primary circuit by a contact of the vibrator there will be a sudden rise in electromotive force, then a period of discontinuity in the line current, and then, upon the break of the interrupter, a sudden rise of electromotive force in the reverse direction, thus developing upon line reverse currents with periods of interruption. At first blush the claims seem capable of a construction which would subordinate all of the high tension systems of transmission now in use. The only figure contained in the patent is illustrated in the accompanying engraving. The patent is based upon a patent issued in France in April, 1881, and an English patent of September, 1881. As the term of an English patent is only 14 years, the American patent would expire in September, 1895. If an attempt be made to interpret the claims in a way to cover the recently developed high tension systems, it will be interesting to note what views the courts will take of the long sleep the inventors took upon their rights to secure an American patent. So far as the method of raising the tension at the transmitting station is concerned, and then lowering it at the receiving station, it would seem to be fully anticipated by a French patent issued to Louis Maiche, September 15, 1880, upon which the United States patent was granted

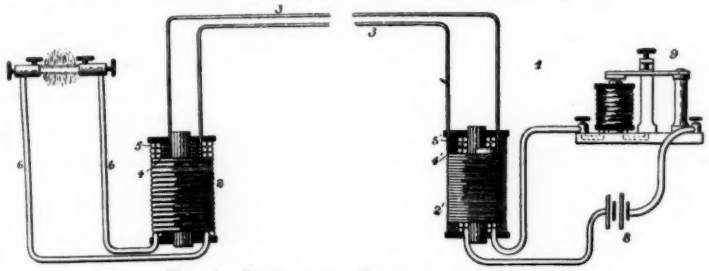


FIG. 1.—DEPREZ AND CARPENTIER PATENT.

June 28, 1881, No. 243,454. In the accompanying engraving we illustrate Maiche's system, which comprises a local circuit at a transmitting station, including a telegraphic outfit and a Rhumkorff induction coil for raising the tension of the currents, which are reduced by a step-down transformer or induction coil at the receiving station. In the engraving illustrating Maiche's outfit, G, G^1 represent a signaling key, K, K^1 receiving instruments, e, e^1 local batteries, and b, b^1 induction coils provided with automatic vibrators. So long as a signaling key is held closed in this system the automatic vibrator will act and transmit a series of impulses of high tension over line, and these impulses will be, during the period of closure of the key, "maintained and practically uniform currents of high tension" in precisely the same sense that the currents developed in Deprez and Carpentier's system are. The claim in Maiche's patent is monumental in modesty compared with those above quoted. It is as follows:

"The combination, with a telegraph line wire, of an induction coil having its secondary circuit connected with said line and with the ground, a local battery and a circuit closing key included in a circuit with the primary coil of said induction coil, which circuit is normally open, and a rheotome arranged to rapidly make and break said circuit when said key is closed, and a receiving instrument connected with the primary coil of an induction coil, the secondary coil of which is connected with said line, whereby said receiving instrument may be operated by a quantity current of low tension to produce the practical equivalent of dots and dashes, or makes and breaks, of varying lengths, the dashes or makes longer than a dot being each formed by a series of rapidly consecutive pulsations over the line, essentially as set forth."

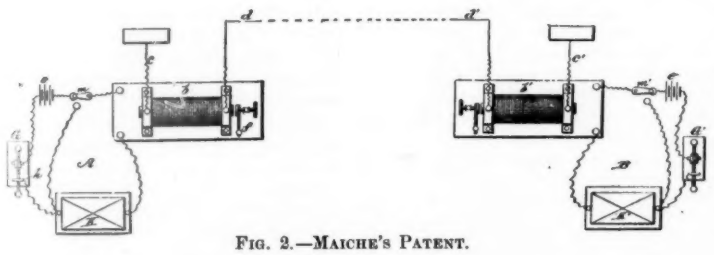


FIG. 2.—MAICHE'S PATENT.

Another Electrocution.

At Sing Sing prison an Italian murderer of the name of Cotto was electrocuted in the morning of March 28. The usual sickening scenes occurred. Five shocks were necessary to kill the poor wretch. The total time of the application of the current was 69 seconds, divided as follows: First contact, 10:45:20; off, 10:45:32; second contact, 10:45:35; off, 10:45:47; third contact, 10:46:05; off, 10:46:17; fourth contact, 10:47:45; off, 10:48:03; fifth contact, 10:49:15; off, 10:49:30. The mean voltage was 1,600. The highest voltage was 1,684. The amperage was 7 throughout.

An Improved Form of Induction Coil.

BY H. N. WARREN, RESEARCH ANALYST.

The original construction of induction coils known as the continuous wind, constituting what is known as the secondary coil, has been of late superseded by what is termed the segment wind, differing both as regards its insulation and also in its effects when compared with the former system. The following description of a machine of this construction will afford a brief idea of the benefits derived over other systems, when every advantage is taken, in manufacturing an article of this description, to avoid, if possible, the use of impure elements.

In this case the primary core was prepared by precipitating pure oxide of iron, igniting and reducing it in a current of hydrogen gas; afterward fusing and forging the same. Of this substance, 10 pounds of wire, about the thickness of a wax match and a foot and a half in length, was selected, a pure iron rod composed of the same substance also passing through the center. This core was covered with several layers of paraffined silk, over which was wound four pounds of very thick insulated copper wire, each layer being carefully insulated; the whole being enclosed, save the extremities, in a thick ebonite tube. Upon this was mounted the secondary, consisting of 25 pounds of No. 22 double silk covered wire; on the whole, this may be regarded as a thick wire, but the strength afforded, both as regards the spark obtained and also the amount of current allowed, was well merited. The secondary was composed of 52 segments, each separated from each other by mica plates; the whole being coated with paraffine to about two inches in depth, being further cased in ebonite. To the contact breaker of the machine, in order to absorb the spark, were connected 500 sheets of copper foil, each being insulated by paraffined silk and protected in the usual manner. The machine, as now constructed, required five Bunsen quarts to urge it to its full. The spark thus obtained, which was nearly 15 inches in length, was the most intense I have ever seen. In some instances the sudden discharge was equivalent to the report of a rifle, affording a constant stream of thick fire resembling lightning. The supply of ozone liberated was very considerable, almost immediately bleaching cotton fabrics when brought near the same in a moist condition; two dozen large vacuum tubes, two feet long and upward, were instantaneously lighted; and deal boards, to the thickness of half an inch, were readily pierced; almost every elementary substance was speedily volatilized when brought in contact with the spark and their spectra thus revealed by the aid of that instrument. —*Chem. News.*

Band Playing in London Heard in Paris.

An interesting and amusing instance of the efficacy of the London-Paris telephone occurred the other day which is worth recording. The Salvation Army band were marching from the Royal Exchange, London, playing the "Marseillaise" when an idea struck the members present in the telephone room. The windows and doors were thrown open and the attendant at the Paris end was asked if he could hear anything. The response (in French) was immediate. "Yes, I can hear a band playing the 'Marseillaise.'" That a band of music playing in the streets of London could be plainly distinguished in Paris is a sufficiently striking marvel of the nineteenth century science.

Hillsboro, Ont.—Electric Light and Water Company; capital, $40,000. Promoters, H. V. Gales, D. Rankin, W. E. Pruyn. Incorporation papers sent to H. V. Gales, Hillsboro, Ont.

Hempstead, N. Y.—Citizens' Lighting Company; capital, $25,000. Promoters, Thos. Henderson, Fred. L. Richmond, Saml. B. Althause, Jr., all of Far Rockaway, N. Y.

Glenwood, Ia.—Glenwood Electric Light and Power Company; capital, $20,000. Promoters, W. H. McClusky, J. H. Howe. Incorporation papers sent to J. H. Howe, Glenwood, Ia.

Storm Lake, Ia.—Storm Lake Electric Light and Power Company; capital, $25,000. Promoters, Edgar E. Mack, Z. C. Felt, E. C. Coles. Incorporation papers sent to E. E. Mack, Storm Lake, Ia.

Milwaukee, Wis.—White Fish Bay Water, Light and Power Company; capital, $50,000. Promoters, C. R. Gethn, D. Harlow and H. W. Gilbert. Incorporation papers sent to C. R. Gethn, Milwaukee, Wis.

Jersey City, N. J.—The Delafield Construction Company; capital, $100,000. Promoters, T. Delafield, W. G. Cook, R. W. Billings. Incorporation papers sent to F. C. Dow, 192 Broadway, New York city.

Hinton, W. Va.—The Hinton Electric Light and Power Company; capital, $50,000. Promoters, F. R. Van Antwerp, J. A. Parker, L. P. Graham. Incorporation papers sent to Thompson & Lively, Hinton, W. Va.

Crafton, Pa.—The Crafton Light and Power Company; capital, $10,000. Promoters, S. A. Duncan, Wm. M. Galbraith, J. A. Langfilt. Incorporation papers sent to Wm. M. Galbraith, 414 Grant street, Pittsburgh, Pa.

Coatesville, Pa.—The Coatesville Electric Light, Heat and Power Company; capital, $25,000. Promoters, Chas. H. Speahman, M. W. Pownall and J. V. Pennegar. Incorporation papers sent to M. W. Pownall, Coatesville, Pa.

Johnson's Creek, Wis.—The Johnson's Creek Electric Light and Water Power Company; capital, $2,000. Promoters, J. D. Bullock, G. C. Mansfield, H. C. Christians, H. J. Grell. Incorporation papers sent to Kirkland & Grimme, Jefferson, Wis.

Austin, Minn.—Austin Electric Company; capital, $50,000. Promoters, H. M. Byllesby, H. C. Levis, B. F. Week, Jr., W. P. Johnson, St. Paul, Minn.; W. S. Pierce, Austin, Minn. Incorporation papers sent to H. C. Levis, 401 Sibley street, St. Paul, Minn.

Queen's Standard Portable Tachometer.

Queen & Company, Philadelphia, are just placing on the market a new portable tachometer which has peculiar advantages that render it of great value for instantly determining the speed of rotating shafts. Three spindles are geared to the rotating parts inside of the case, each one of them having a separate scale on the dial, so that the indications are direct reading throughout. A detachable point, with slightly flexible end, to fit any of the spindles, is supplied, the flexibility of which acts as a safeguard, for, if made perfectly rigid there is danger of breakage when not applied exactly at right angles to the shaft. A scale to correspond with each spindle is graduated on the dial, and the ranges covered are: 40 to 200, 120 to 600 and 600 to 3,000, which gives a maximum capacity of 40 to 3,000 turns per minute. A conveniently shaped handle is attached to the body of the instrument so that it can easily be held in the hand.

The apparatus is well made and presents a handsome appearance, the different parts being nickel plated. A tachometer like this is very desirable for both expert and practical work, and those interested in the subject should write to the makers for a copy of circular No. 310.

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The Philadelphia councils have overridden the Mayor's veto of the trolley ordinance, and Benjamin Franklin's town will soon be startled by the meteoric flitting to and fro of the trolley car. The old philosopher may now rest easily in his tomb, as the salvation of his fellow citizens from a sleepy death is assured.

Writing of an accident which happened at the plant of the Louisiana Electric Light Company, in New Orleans, a reporter for the *Times-Democrat* uses this picturesque language:

"The machinery of the electric light company is necessarily enormously powerful. The fly-wheel is journaled upon the second floor, and revolves at a lightning speed through the entire height of the first and second stories. Its unrelenting cruelty and titantic power, so awe-inspiring to those who tremble, despite themselves, in looking upon its enormous and furious gyrations, was terrifically exemplified in the *coup de grace* last evening of which poor Clancy was the victim."

The figures presented in the annual report of the American Bell Telephone Company, published in this issue, show to what enormous proportions the telephone industry has grown. And the end is not yet.

Combinations seem to be the order of the day. It is rumored that an aggregation of several well known companies will pool their issues in competition with the General Electric Company. W. and s.—wait and see.

The subject of insulating against high potentials is of special interest just now. A valuable contribution to the art is the work of Messrs. Bourne, described in this REVIEW. The tables comparing the sparking gaps when points and surfaces are used, respectively, seem to indicate that as the potentials rise the difference of electrode shape becomes of less importance. These results do not coincide with those of other investigators, notably Prof. Elihu Thomson, who operated with much higher voltages and found a great disparity between the resisting power of gaps between surfaces and others between points.

The Commissioner of Patents announces that a display of typical inventions patented in the United States, as exemplified in models, will be made at the World's Columbian Exposition. This will form an exhibit of great interest and one that will be highly instructive. It will be an object lesson on industrial development. The commissioner laments that the display will be more or less incomplete, owing to loss of models by the great Patent Office fire and because during the past 10 years it has been the general practice not to require models. The appropriation for the use of the patent exhibit is so small that it will be impossible for the commissioner to reproduce models, and he therefore suggests that inventors and manufacturers construct models or loan such models as are in their possession of such important inventions as might properly form part of such a collection. This suggestion is worthy of adoption. It is hoped that electrical manufacturers will co-operate with the commissioner and signify a willingness to assist in making the patent display a thorough success.

FLYING.

Mr. Hiram S. Maxim writes from England to the editor of the *Century*, saying that he has received a large number of congratulatory letters from England and France, and two of a depreciatory character from the United States, in reference to his article on "Aerial Navigation—The Power Required," which appeared in the October issue of that magazine. It will be remembered that the apparatus Mr. Maxim described was not a flying machine, but was designed to ascertain how much power was required to perform flight with a screw-driven aëroplane. The results obtained were valuable to Mr. Maxim and could have been arrived at in no other way. Mr. Maxim concludes his letter as follows:

"In the machine which I am building, and which is intended for free flight, the most intricate part of the whole thing is the apparatus for keeping the machine on an even keel while flying. This apparatus does for the machine what the brain does for the bird. The least deflection from a predetermined angle instantly applies an enormous amount of energy to the planes of the machine, changing the angles of some in order to maintain the angles of others.

"The machine consists of one very large plane with smaller ones attached to it. I do not anticipate any insurmountable trouble in the direction of maintaining the principal plane of my machine at any angle desired. My apprehensions at the present time are altogether of another kind: Will my engines be strong enough?

"With the data and formulæ which I have at hand, it would appear that they are, and with a large margin of energy to spare; but the machine is very much larger than any that has ever been made before, and possibly there may be another and an unknown factor—the factor of size."

Mr. Maxim must excuse the skepticism of his fellow countrymen who have so often been imposed upon in the matter of flying machines; at the same time we all hope that the first successful flying machine will be the invention of an American.

"LET US PUT A STOP TO THIS BARBAROUS AND REVOLTING BUSINESS!"

Another human victim has been led to the slaughter and the blot on the name of New York State is one unit larger. This time five electric shocks were necessary to torture to death the prey of the Gerryciders. "Cotto was an arrant coward. He was the least interesting of any of the seven men who have been killed by electricity in the prison. He had stimulants enough in him, however, to prevent his making a scene in the death chamber." Perhaps this was a new phase of "scientific investigation" attempted by the eminent medical talent in charge of the latest electrocution? Are the inquisitors now satisfied that a human being loaded with whisky is not so easily electrocuted as one already half dead with fright?

The New York *Sun* thus speaks of the affair:

The killing of Cotto by electricity at Sing Sing on Monday was the latest experiment with this new and strange agent for producing death; and it was no less horrible than those which have preceded it.

Five shocks were applied to the victim before he was pronounced dead. The method of administering them was changed, as it has been changed successively in each of the experiments from the beginning with Kemmler. The horrible death chair had undergone alterations. After four strokes of electricity, the heart of the victim was found to be beating; and only after the fifth had been turned on did the doctors pronounce him dead.

It seems inconceivable that human beings can be found to assist at such a scene. If Cotto had been a dog and not a man, the long-continued experiment on him would have been revolting. No one present could predict with any certainty how the experiment would turn out, except that in the end Cotto would have to be killed by electricity, whether five or 500 applications should be necessary.

In speaking of the last experiment in electrical killing at Sing Sing, the London *Lancet* expressed the hope that a sense of professional decency would keep physicians from again taking part as witnesses or assistants at such a scene; but it seems that doctors were found who were willing to watch the horrible performance, though Dr. Ward and Dr. Macdonald, who had so served at previous executions, were glad enough to keep away.

In the name of civilization, and as people of a Christian State, let us put a stop to this barbarous and revolting business!

Let the legislature pass the bill returning to hanging and thus save New York from the disgraceful reputation which the experimental method of electrical execution gives it before the civilized world.

Repeal the electrocution law! While it exists, the statute books of New York are a living disgrace to civilization.

It is a pity there is no law in this State under which wire tappers can be brought to grief. The story of their ingenious deviltry, printed on another page, shows how a clever but unprincipled telegraph operator can steal valuable news from a wire and turn it to profit without meeting the punishment he deserves. The difficulty should be overcome by the enactment of suitable legislation. It is found possible to defeat these operations by using a cipher, but in race news the cipher is used only between the track and the main telegraph office, the news being transmitted to individual bookmakers in signals intelligible to any telegrapher. An obvious experiment would be to use a separate cipher for each bookmaker. This would involve extra work at the main office, but it would not require great ingenuity to devise a typewriter which would transmit in a dozen separate ciphers the same news to as many city circuits. Each bookmaker would thus have the secret of his own code, known only to himself and a trusty operator at the main office. It would be well, in the absence of a protecting law, for telegraph people to use their wits and thus beat the sharps at their own game.

A recent issue of *Frank Leslie's Weekly* contained a double page supplement showing a bird's eye view of Madison Square Garden with its handsome tower. The plate was printed in colors, and in point of excellence of execution was fully up to high-class French work of that character.

CORRESPONDENCE.

OUR SEATTLE LETTER.

The Electric Lighting Plant of Everett will be run by the machinery of the nail factory.

The Point Defiance, Tacoma and Edison Railway will be equipped with electricity by the Thomson-Houston Company.

Thomas Finn, a motorman in the Grant Street Electric Railroad had his leg broken a few days ago by a collision between two cars.

On **March 17,** William Armstrong, formerly manager of the Sunset Telephone Company of this city, committed suicide at Spokane. He was in the jewelry business there.

The **Union Trunk Line** of this city, is erecting a passenger station at its power house. The electric branch lines center there and transfers can be made under cover.

The **Western Union Telegraph Company** and the Pacific Postal are contesting in the courts over the right to build north into Canada along the line of the Seattle, Lake Shore and Eastern Railway.

B. W. **Levins,** E. L. Giroux and W. H. Packwood, Jr., of Baker City, Oregon, and R. A. Chamberlain, of San Francisco, have formed a company to utilize the waters of Pine and Rock creeks for electric power, which will be conveyed by wires to Baker City. The distance of transmission is about 14 miles.

Mrs. **Annie Sears** has obtained a verdict for $15,000 damages against the Seattle Consolidated Street Railway Company. She sued for $25,000. On September 16, 1891, a car in which she was riding ran into a wagon and, as a result, she was thrown from the car and so seriously injured that she will be an invalid for life.

Seattle is now ahead of Tacoma in the number of telephones in use, having 810 against Tacoma's 760. In the Seattle exchange the operators make between 6,000 and 7,000 switches every 24 hours. During four hours in the busiest part of the day one operator has made between 400 and 500 switches, an average of one and a half to two every minute.

The **Seattle General Electric Company** and the Home Electric Company have consolidated into the Union Electric Company with a capital stock of $1,000,000. The trustees of the new company are Isaac Dobson, John H. McGraw, C. P. Stone, James A. McWilliams, Augus Mackintosh, J. M. Frink and E. C. Kilbourne. They have elected the following officers: President and general manager, E. C. Kilbourne; vice-president, J. M. Frink; treasurer, C. P. Stone; secretary, J. T. Robinson; assistant secretaries, F. C. Dimock, Seattle, and Augustus Rappard, New York; assistant manager, A. L. Hawley; general superintendant, James A. McWilliams. T. H. Tyndale, manager of the Seattle General Electric Company, will retire from active interest in the new company, and will leave the city. The separate plants of the two old companies, the Home and the General, will continue in operation as at present. The consolidation will result in the taking down of about 400 duplicate poles. The old Seattle General Electric Company used the Edison system, in which Henry Villard is known to be deeply interested, while the old Home Electric Company used the Thomson- Houston.

Frank **Jaynes,** of San Francisco, coast superintendent for the Webster Union Company has been here trying to arrange for a lease of the Great Northern Telegraph Line from here to New Westminster. No agreement has been reached. In speaking of the new plans of the company, Mr. Jaynes said to the correspondent of the ELECTRICAL REVIEW:

"How soon we shall extend further depends on the railroad developments of the year. We have a franchise along the Great Northern Road, and are extending our line along it as fast as it is built westward. The Great Northern Company claims, however, that the franchise does not extend beyond the point where its main line strikes salt water, and, therefore, does not apply to its coast lines. It is operating the telegraph system along its coast lines independently, but I believe that is only an experiment to see how much there is in it, and that we shall ultimately have the franchise on the whole system. When that time comes we shall extend northward to the boundary and across to the British Columbia cities. We are awaiting railroad developments, because it does not pay to build a line through these dense forests and then abandon it a year or two later when a railroad taps the territory. The Pacific Postal has discovered that through its highway line north of here

"A TELEGRAPH LINE OPERATED BY A RAILROAD COMPANY NEVER PAYS.

"The Southern Pacific operated its telegraph line formerly and lost money on it. It was glad to lease it to us, and we have made money on it. There is such a vast amount of detail in the business as to make it distinct from railroad business. The Baltimore & Ohio Telegraph Line was built for the purpose of fighting us, and it involved a loss of as much as $230,000 a month. It was constantly extended into new territory, where it did not pay, and the war of rates was carried to an absurd point. It was taking messages from Chicago to St. Louis and from Chicago to St. Paul for five cents, scarcely enough to pay for delivery, and we met the rate. The Baltimore & Ohio was losing money everywhere, because wherever it did business it was making these ruinous competitive rates, while we had a vast stretch of non-competitive territory to help us out. Finally, the system, which cost $12,000,000 to $13,000,000, was sold to the Western Union for $5,000,000." H. L.

Seattle, W., March 25.

OUR SAN FRANCISCO LETTER.

The Woodland Electric Light Company has added two Edison dynamos to its equipment.

A Consolidation has been effected between the electric and cable lines of Los Angeles, Cal.

The San Francisco "Examiner" building has just been equipped with a 500 light dynamo, which is to furnish illumination for its editorial, composing, press and stereotype rooms.

A Curious Complication exists in San Jose regarding the ownership of the great electric light tower, it being claimed by the city as well as by two rival electric light companies.

A Franchise has been granted to a company in Bakersfield, Cal., for the purpose of building an electric road from the Southern Pacific depot to Rosedale. Power is to be furnished by a drop in one of the large irrigating canals.

The Installing of a Gamewell fire alarm system has recently been completed in San Diego by F. C. Stover, the Pacific Coast agent. The system was found to work admirably and was accepted by the city. Twenty-five boxes are in use.

The 50 Year Franchise which was recently granted to the Sunset Telephone and Telegraph Company by the city council of Oakland, stipulates that inside of six months work of laying underground conduits must commence, and within a year not less than $10,000 be expended on the system.

The Metropolitan Railway Company, of this city, which recently commenced work on its electric road, has been enjoined by the city and county from using the trolley system on Mason street, between Market and Eddy, on Eddy between Market and Hyde, and on Hyde between Eddy and O'Farrell. These places are within the territory where the use of the overhead system is forbidden. In the meantime, workmen continue to lay the track, but no attempt is being made to string overhead wires.

A Company of local capitalists has been formed in Alameda to erect an incandescent lighting plant. The company will endeavor to persuade the city to allow them the privilege of running the municipal arc plant, which the city terms its "white elephant," and with which it has had no end of trouble. The dynamos are of an old pattern, and, in fact, the whole plant seems to be going to ruin. A few months ago a 125 foot iron tower belonging to the plant toppled over, and it seemed miraculous that no one was killed. Last week a 30 foot pole fell over while a lineman was mounted on top removing some wires in order to allow a moving house to pass, and injuries were sustained which came near causing his death. As it now stands, the city is in a quandary as what to do with the plant.

The Great Street Railway scheme projected by W. B. Wilshire, of the Wilshire Safe and Scale Company, of this city, outrivals the one proposed by J. W. Hartzell, mention of which was made in a former letter. Mr. Wilshire asks the supervisors for a franchise allowing him the privilege of erecting and operating a railway system covering a territory of over 23 miles. The road will be divided into seven sections. Two lines will extend from the water front to the ocean, while a cross-town line will begin at Lewis and Filmore streets, running through the latter to Ridley street, and through Ridley to Church, extending to Twenty-first and to Mission. These are the main trunks from which the other branches will spring. In all probability electricity will be used as a motor power, although the petitioner also asks the privilege of using cable or horse-power.

San Francisco, March 28. J. R. K.

OUR CHICAGO LETTER.

After April 15 the Chicago office of the Detroit Electrical Works will occupy suite of rooms 917-918 in the Monadnock building.

The Central Electric Company are preparing a house goods catalogue which they hope to have ready in April. The catalogue will be replete with cuts and descriptive matter of the latest designs in this department of their business.

The Illinois Electric Lamp Company, organized under the laws of the State of Illinois with a capital stock of $25,000, have completed their factory and are now making the Jewell incandescent lamp, with a capacity of 1,000 lamps per day.

Professor Cook, of the Northwestern University, will address the Chicago Electrical Association on Tuesday evening, April 12, on the subject of Hertz's experiments. This lecture will be held at the usual meeting place in the Athenæum building.

The Rockford Electric Manufacturing Company, Rockford, Ill., through their Chicago office, have just installed a 300 light plant in the Chicago Oyster House, on Madison street. This company also reports the sale of several small motors lately.

Cutter's Lamp Supporting Pulley, which was illustrated by us a few weeks ago, is being adopted by plants throughout the country. Many stations are taking down their old pulleys and substituting these, because they are so much safer and more reliable.

The Central Electric Company are sending out a very handsome circular in reference to tested fuse wire and terminal fuses. The circular contains an article on fuse wire that was read before the Chicago Electric Club, December 7, 1891, by Mr. Elmer A. Sperry, and contains valuable information on this most important subject.

A Course of Six Lectures on physics will be given at the Hull House, No. 335 South Halsted street, during the Spring. They will treat of the subject in an elementary nature, having in view a more comprehensive course in the Fall. The importance of physics as a branch of electrical engineering is acknowledged, and it is hoped that those engaged in electrical work will give this course their hearty support. Physics is an interesting study, and the knowledge of it is of great practical value. The lectures will be given in the evening, at 8 P. M., on the following dates: 1. Introducing Remarks on Physics and the Determination of Units. Explanation of the Metric System, April 12. 2. The Laws of Motion, April 19. 3. The Forces of Nature, April 26. 4. Energy, May 3. 5. Heat, May 10. 6. Sound, May 17.

Vincennes, Ind.—In 1886, the Vincennes Electric Light and Power Company, Vincennes, Ind., installed their original steam plant, which consisted of two 9½x10 Armington & Sims engines; two 50 horse-power boilers, set with improved furnaces and grates; feed water heater, two Blake steam pumps, injector, etc. The company is now make arrangement to put in a 1,200 light, alternating incandescent machine, for commercial and domestic service. Bids for enlarging and remodeling the power plant were solicited. After careful consideration the proposal handed in by the Pond Engineering Company, St. Louis, was finally accepted. It contemplates the furnishing of one 110 horse-power Armington & Sims' engine and a 66x16 flange steel boiler, with rocking grates and Pond improved furnace, a 200 horse-power feed Hoppes water heater, and two No. 4 Blake boiler feed pumps. The Pond Company is to deliver and erect all this machinery in Vincennes, at the same time remodeling their pipe work, so as to make a compact and well arranged system throughout. It is expected that the new plant will be in operation early in May. M. J. B.

Chicago, April 2, 1892.

OUR BOSTON LETTER.

The Boston Electric Club will have its regular monthly dinner at Young's Hotel, this city, Wednesday evening, April 6.

The New Works of the Fitchburg Steam Engine Company are about completed, and the larger increased manufacturing facilities will soon be in readiness.

The Lamprey Boiler Furnace Mouth Protector Company, Boston, are receiving handsome orders from numerous manufacturing concerns in different parts of the country for their specialty.

Mr. William Stanley, Jr., of the Stanley Electric Company, will be one of the several prominent electricians who have kindly consented to deliver remarks at the Boston Electric Club dinner.

Messrs. R. D. Wilson and Company, this city, the well known bankers and brokers and dealers in electrical securities, have removed to a more commodious location at No. 40 Water street, corner of Congress street.

The Siemens-Halske representatives have been in this vicinity very recently looking over the ground. Of course, it is simply conjecture whether the German electrical people will conclude to build its American works in New England or in the West.

Messrs. Hill, Clarke & Company, this city, have purchased the business of A. J. Kirkwood & Company, Chicago, Ill., and will combine with it the business of their Chicago branch house. The company hereafter will manufacture metal working machine tools.

Mr. William A. Hall has become associated in business with his father, Mr. Thomas Hall, the well known dealer in electrical and scientific instruments and supplies, No. 19 Bromfield street, this city. The firm will be known henceforth as Messrs. Thomas Hall & Hall.

Mr. C. A. Baldwin, who has ably and otherwise creditably represented the *Electrical World* in this section for about a year, has resigned his position to enter in partnership with his two brothers in the banking and brokerage business, this city, under the firm name of Baldwin Brothers.

Messrs. Volney W. Mason & Co., Providence, R. I., have applied quite a number of their new whip hoists to be driven by electric motors. Among the latest are the flour store of A. B. McCrillis & Company, and the Providence Coal Company. Providence is well supplied with electrical power by the Thomson-Houston Company, and it offers a good field for the hoist.

The Rockland and Camden Electric Railroad Company has closed a contract with the Edison General Electric Company for a complete installation of electric equipment for the propulsion of its cars for passenger and freight purposes. This road is 9½ miles long. The power plant will consist of two 100 kilowatt machines and Geo. H. Corliss cross compound condensing engines. The first equipment will be of six cars, each to have two 20 horse-power motors, and eventually this number will probably be doubled.

The Standard Coal and Fuel Company, with offices in the Equitable Building, this city, is enjoying a large and rapidly growing trade among the electric light stations and manufactories in the New England States. This company's product, known as "Kem-Kom," is a material which possesses, when applied to coal, the remarkable quality of increasing its efficiency in producing heat, thus enabling an important economy to be made in the amount of coal used, and also admitting of the use of inferior grades of coal to do the same work as those of a superior quality. "Kem-Kom" possesses many other advantages which may be ascertained by applying for a copy of the company's neat little catalogue. W. I. B.

Boston, April 2.

PERSONAL.

Mr. C. O. Baker, Jr., has returned to New York, after an extended Western trip.

Mr. A. H. Chadbourne, of Philadelphia, visited New York on business last week.

Col. George L. Beetle, of the Western Electric Company, Chicago, is in the city.

Mr. W. J. Crozier has been appointed superintendent of the Birmingham, Conn., electric railway.

Mr. T. W. Sprague, of the Thomson-Van Depoele Electric Mining Company, Boston, was in town for a few hours last week.

Mr. Eugene F. Phillips, president of the American Electrical Works, Providence, R. I., was a New York visitor last week.

Mr. E. A. Colby has returned to New York after a nine months' residence in San Antonio, Tex., where he has been installing an electric railway.

Mr. Alfred E. Braddell, of Philadelphia, electrical inspector for the Underwriters' Association of the Middle Department, was a New York visitor last week.

Prof. Alexander Graham Bell has returned to Washington from his recent European trip and will soon leave for Boston, where he will engage in experimental work.

Manager Babcock, of the Connecticut Time and Electric Company, has resigned. C. D. Warner, general manager of the Standard Electric Time Company, of New Haven, has been chosen to fill his place.

Dr. J. A. Norton, commissioner of railroads and telegraphs for the State of Ohio, has presented to Governor McKinley his resignation, to take effect at such time as may please his excellency, and insisting that it be accepted by May 1.

Death of Marmont B. Edson.

Marmont B. Edson died in this city Saturday evening last, of heart failure, after a brief illness. Mr. Edson was in his seventy-ninth year, and although born in Otsego county, N. Y., has spent the most of his lifetime in this city, where he has been prominently connected with the Gold and Stock Telegraph Company, the Celluloid Company, the Edison Electric Companies, the Bell Telephone Company, and many other modern enterprises in which he took great interest. Always of pronounced views on live issues, he was as conservative and unostentatious in the display of them as in the bestowal of his generous bounty to the many who will remember his genial nature and practical sympathy extended alike irrespective of race, color or creed. Mr. Edson leaves a wife and two children, Jarvis B. Edson, of Brooklyn and Mrs. James Herman Aldrich, of this city.

Telephonic News

*** A telephone exchange is to be established at Fernandina, Fla.

*** Brookfield, Mo., is agitating the establishment of a telephone exchange.

*** Earlington and Madison, Ky., are soon to be connected by telephone.

*** The Chicago Twin Wire Telephone Company has asked the city council for a franchise.

*** There are now 70 telephones connecting the different departments of the Thomson-Houston factories at Lynn, Mass.

*** The Sunset Telephone and Telegraph Company will build a new telephone line from Tacoma and Seattle to Snohomish, Wash.

*** In Vermont and New Hampshire there are said to be 100 towns where an endeavor will be made to establish telephone exchanges.

*** It is learned that a long-distance telephone circuit is contemplated between Portland, Me., and Cincinnati, O., the line running from Akron through Millersburg, Mt. Vernon and Columbus, O.

*** The output of the American Bell Telephone Company for the month ending March 20 was as follows:

	1892.	1891.	Inc.
Gross output	8,334	5,717	2,617
Returned	3,700	3,167	533
Net	4,634	2,550	2,084

From Dec. 20, 1891, to March 20, 1892:

	1892.	1891.	Inc.
Gross output	21,898	15,954	5,944
Returned	13,006	9,561	3,445
Net	8,892	6,393	2,499

The "Maine."

The Providence & Stonington Steamship Company's magnificent new steel steamer "Maine," now in commission on the Stonington Line, is proving a notable addition to the Sound fleet, and is making a record as a fine seaboat and a swift sailer.

She is now making regular trips between New York and Stonington (125 miles) *en route* to and from Boston and the East, averaging about seven hours. The "New Hampshire" will be finished and go into commission on the Stonington Line in about three weeks.

May Cities Sell Electricity?

The constitutionality of another law enacted by the last Pennsylvania Legislature has been attacked. A bill in equity was filed in the Franklin County Court recently by a number of taxpayers of Chambersburg, asking that an injunction be issued to restrain the Chambersburg Council from complying with the act of Assembly of May 20, 1891, permitting boroughs to manufacture electricity for commercial purposes. The bill alleges that this is a private business, and that the law permitting municipalities to engage in it violates the spirit and meaning of Section 7 of Article IX of the Constitution.

Cutting Ice with an Electric Wire.

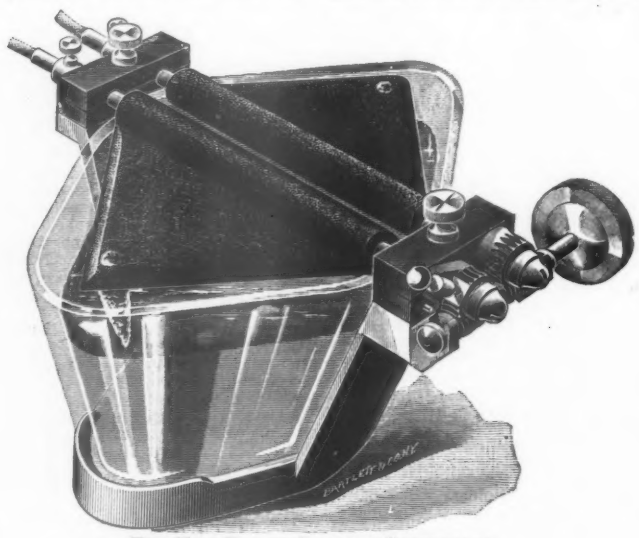
A new departure in ice cutting has been proposed by a man who contends that it is quite practicable to cut the ice by means of a wire heated electrically. His plan is to install a portable steam and dynamo plant at some convenient point on the shore near to the ice harvesting operations, and run from the dynamo a suitable steel wire of the required length with a proper return. By generating a sufficient current to maintain the temperature in the wire at about 200 degrees, and by stretching the wire taut along the surface of the ice, a means of cutting through the mass would at once be established. He forgets that the water would congeal immediately after the wire had passed, leaving the ice as solid as ever.

The New Bailey Current Controller.

The Law Telephone Company, 85 John street, New York, have recently brought out a new form of their well known Bailey current controller, which is shown in the accompanying illustration.

Briefly described, it consists of two triangular shaped carbon plates, each carrying a bit of sponge at one of its angles, and so mounted over a small glass cup of water that, by means of a worm gear, operated by a hand wheel, the sponge tips are gradually moved down into the water and toward each other until the plates touch at their lower points; or, by turning a thumbscrew, the left-hand plate may be unlocked from the gear and moved as far into the water as desired, and then the other plate gradually turned down toward it. This last method gives a still more gradual increase of current. Each shaft passes through the center of a hole running the entire length of the longest edge of the plate, and is "moulded in" with "pure tin," the tin completely filling the space between the shaft and the carbon from end to end. An electrical connection is thus had, having an abundance of conductivity, and one which is non-corrodible, beyond any question. Each plate is 3½"x3½"x4"; the whole apparatus is, over all, 7" long, 7" wide, 4½" high, and weighs two pounds. The carbons are handsomely moulded, and the mountings highly finished and perfectly fitted. This current controller or rheostat will give, it is said, a current at the outset more feeble than any other instrument of its kind or character can give, and will increase the current without variation or fluctuation, which has never before been done, and, finally, will give the full strength of the battery actually without shock, which is also for the first time accomplished. It is the only instrument in which each electrode moves toward the other. Here, at the start, they are fully six inches apart, and at the finish actually in hard contact, and, as before stated, they get there without the least shock to the patient. This fact is due to the gradual coming together in water of the two large flat surfaces of carbon. There is no cover over the plates, and when out of water they are separated fully three-sixteenths of an inch; hence, there is no danger of escape of current by means of water adhering between them or by moisture of condensation. In the construction no wax or cement is used, and no frail parts or connections.

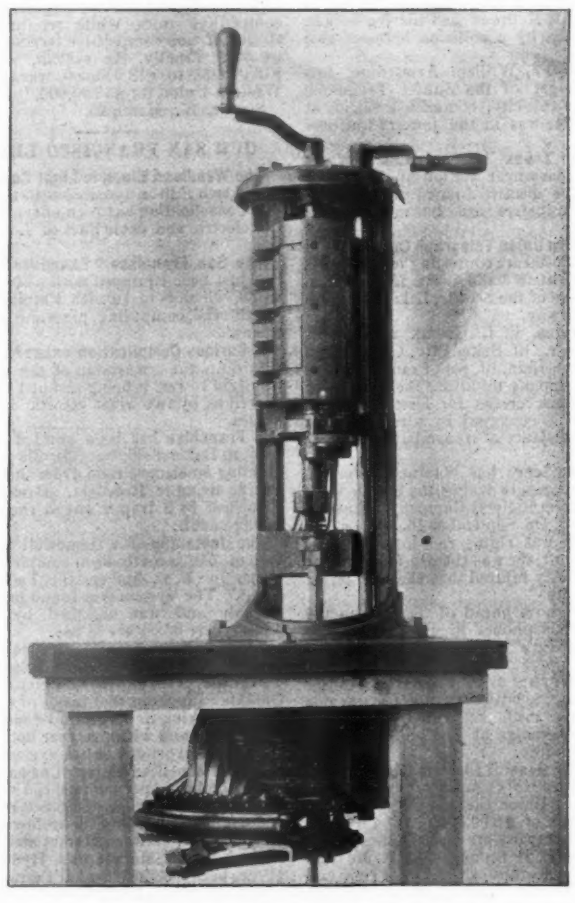
While the old Bailey controller has been the best thing of its kind, it has been far from faultless. High resistance would often be developed at the point of connection with the carbons, and the connection would frequently corrode off; the insulation of the plates was never very high, and there was always more or less escape through moisture on the surface of the insulating material; the vessel being closed, the carbons frequently became impregnated with foul matter rising from the decomposed water; the jar was not easily emptied and refilled; the plates and other parts were fragile; it gave too much current at the start, did not always increase it without fluctuations, sometimes quite severe, and it never gave the full strength of the battery at the finish; it was cumbersome, and, in order to close the desk, table or cabinet containing it, some device for locating or lowering it, at least partially, below the top was necessary.



THE NEW BAILEY CURRENT CONTROLLER.

The Edison Car Switch and Controller.

The Edison General Electric Company have recently devised a new type of street car controlling switch, intended to take the place of the present platform switch for equipments of large motors, of 25 horsepower and upwards.



NEW EDISON CAR SWITCH AND CONTROLLER.

In starting the car the switch handle is turned from the position marked "off" with a "counter clockwise" movement; this has the effect of carrying the arm of the rheostat placed under the switch around on its contact segments and the resistance is gradually cut out of circuit. After this arm has been carried around and all the resistance cut out, it is released from the cylinder shaft and left locked in this position. Further movement of the handle then affects only the cylinder and commutates the field magnet coils of the motors from series to parallel in the usual way.

In stopping, the field coils are turned from parallel to series, the resistance coil is then again put in circuit, and finally the circuit is broken by the contact lever on the last segment of the resistance coil, and not, as formerly, upon the cylinder contacts. The only caution to be observed in stopping is to see that the switch handle is turned to the position marked "off." As the motors are reversed by means of a separate lever operating a reversing switch placed under the car, the reversing lever is connected to a shaft separated from the cylinder shaft, but interlocking with the cylinder shaft in such a manner that it is impossible to reverse the motors until the cylinder shaft is an "off" position. The cylinder plates and contacts are made of thick iron stampings, as experience has shown that iron is a better material to use than brass, hitherto used. Sparking does not burn the iron as much as the brass, and greater certainty of good contact is insured. The rheostat is of the regular circular pattern resistance coil, which has been in use for some months past as the standard slow starting device. This rheostat is protected by a galvanized iron case, made to suit different car constructions. When fitting the switch a sheet of iron and a layer of asbestos should be laid between the rheostat and the car floor. This will prevent any danger from fire, either from heating or sparking, in case of accident to the rheostat.

The current from the trolley wire first goes through the field coils and switch cylinder for commutation, then through the armature and reversing switch, and thence through the switch contact lever and resistance coil to ground.

Only six wires are run to the platform switch; these are the field magnet wires. The three wires running to the reversing switch are of the same size as the regular armature wires, as is the wire between the metal terminal of the reversing switch and the contact lever of the rheostat. When fitting switches to cars already wired, the cables in use can be utilized, but the terminals of the wires left idle should be well insulated.

A Rubber Trust.

The United States Rubber Company has been incorporated, under the New Jersey laws, with $50,000,000 capital. The incorporators named are: William L. Trenholm, William Barbour, John I. Waterbury and J. Edward Simmons. The principal promoters of the enterprise are said to be Chas. R. Flint and his partner, William M. Ivins.

Wire Tappers at Work.

THEY CANNOT BE PROSECUTED UNDER ANY LAW OF THIS STATE, AND THEY KNOW IT.

A perfectly organized gang of wire tappers is operating from this town, says the New York *Sun*. It consists of about 25 dishonest telegraph operators and as many more dishonest linemen, who tap pool room wires over which the returns of the horse races are sent and defraud bookmakers. They are not amenable to any law, and they know it. Therefore, they drift about the country, tapping wires promiscuously, and making a good living without doing much work. Some are stationed permanently in New York, and they devote their entire attention to the pool rooms of this city. The leader of the gang has his headquarters here and directs his confederates from here. He is well known by the telegraph companies, and is one of the most expert telegraphers in the business. He knows all the operators in the city, and spends a great deal of his time in front of the main offices of the companies.

At intervals for years back the newspapers have had news reports of the work of wire tappers, and in the past few months brief items have appeared telling how bookmakers had been defrauded by the wire tappers. In one instance the wire tappers attempted to operate on a bookmaker in Cedar street. They were captured by the police and locked up in the Church street police station. The janitor of the building into which the race wire had been carried by means of very fine wire identified one of the men as the renter of a room in which telegraph instruments, batteries and all of the accessories of a wire tapper perfectly connected to the pool room wire, had been found. An effort was made by the Western Union Telegraph Company to convict the men, but it was not successful. No law on the statute books was applicable to their case. Although there was no doubt that the men occupied the room to which the wire ran, the company could not prove that they actually cut the pool room wire. Since the discharge of the men several unsuccessful attempts have been made to tap wires in New York.

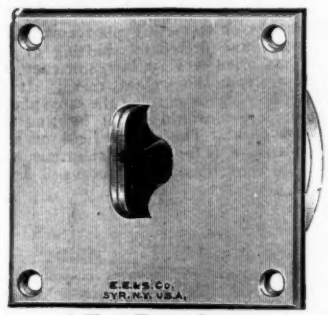
To tap a wire means to cut a wire and make two circuits out of it without the telegraph company knowing anything about it. Usually the wire is cut as near the pool room as possible, in order to give the gang an opportunity to place the bets quickly. Take any pool room down town, for instance. The wire tappers get their bearings by tracing the wires from the interior of the pool room to the roof. Then they send one of their linemen up on top of the building to make the connection. They hire a room a few doors away, if they can, and lead the pool room wire into their rendezvous by a loop of fine, almost invisible, wire. The only furnishings of the wire tappers' room are a cheap pine table, two sets of regular main line telegraph instruments and several battery jars. The wire tappers are between the telegraph office and the pool room, and they can manipulate the wire to suit themselves, provided they are cautious. The preliminary matter about the races they allow to pass over the wire unmolested, listening to it and making what use of it they can.

It is not until the horses are at the post for a race that the wire tappers begin active operations; then they divide the wire into two circuits, one of which runs from the telegraph office to the wire tappers; the other from the wire tappers to the pool room. When news comes from the track that the horses are at the post, it is sent out to all the city pool rooms. Nothing more comes from the race track until the horses are off. During that brief period the bookmakers are busy accepting bets. The horses may be at the post a minute, or they may be there 15 minutes, trying to get away. During that period of uncertainty the wire tappers are able to do their work. They usually take a race that is run without delay. An exceptionally good start is meat for them. When the word comes that the horses are off the wire tappers hold it back from the pool rooms. As soon as the name of the winner is flashed over the wire one of the wire tappers hustles around to the pool room and places a good sized bet on the winning horse. The wire tapper who is working the wire waits a reasonable time for his companion to make his bet and then he sends the characteristic message, "They're off," to the pool room. A few minutes later the wire tapper in the room only a few doors away sends out the information the same as he received it from the telegraph office. He gives the names and positions of the horses at the various distances and closes with the result of the race. The wire tapper who did the betting gets his tickets cashed and saunters out. The gang may repeat their operations on the same bookmaker, but not right away. As a rule, they begin over again and select a new victim.

Years ago, when the telegraph companies introduced the service between the race tracks and the pool rooms, very little vigilance was exercised over the operators. The companies assigned their best men to the wires, and trusted them implicitly. Messages containing information regarding races from owners of runners to their friends passed over the wires, and the operators knew everything that was going on preliminary to the races. In most instances they were honest, and they treated the messages as business affairs. Occasionally, however, an operator who worked one of the wires would take advantage of his position to make some extra money. The news from the race track was received in the main office of the telegraph company and then relayed, or re-transmitted to the city pool rooms, as it is now. The telegraph offices were in the ground stories, and an operator, with the aid of a confederate, had a good opportunity to beat the bookmakers daily without any one being the wiser.

In those days a telegragh operator might be seen standing at the window of a certain down-town office and, apparently, toying with a lead pencil. On the sidewalk could be seen another young man gazing at the man in the window. The man at the window worked a race wire. After each race he would walk to the window and signal to the man outside, by wigwagging his pencil, the name of the winning horse. His confederate would then run to the nearest pool room and place a bet on the race. In the meantime, the operator who had received the returns from the race track would hide the message on his desk for a few minutes, to give his confederate a chance. Then he would hang the message on the hook and let it take its usual course. It would be delayed sufficiently, however, to give the confederate an opportunity to make his bet. That scheme was worked successfully for a long time. The official of the company discovered the leak, and put a stop to it by watching the men.

After that wire tapping became common. A number of dishonest operators, who were out of situations, saw a chance to make a great deal of money with very little work,



A NEW FLUSH SWITCH.

and they tapped the wires at some point between the race track and the city. At first not much difficulty was experienced in tapping the wires. Four men had to operate. Three of them went to some obscure point in the country, where they established their working office by fixing two sets of instruments. Two of the men worked the wires, while the third acted as supervisor of the messages. They deliberately cut the wire from the race track to the company's main office in New York. The operator working the race track end of the wire pretended to be "N. Y.," and the man working the office end passed himself off as at the track. They were able to do that because they were familiar with the work and the men. As fast as messages were received from the track they were read by the supervisor and then forwarded to New York. In that way the supervisor knew everything that was going on, and was able to instruct the New York confederate. From the tone of the messages over the wires from trainers to owners of horses he got tips on the races, and if the result of a race did not agree with the advance tips, he did not hesitate to change the name of the winner before sending the news on to New York. The telegraph companies spoiled that scheme by arranging a cipher, and the wire tappers were forced to prepare a brand new plan. The only possible one that they could devise is in use to-day, and that would not be operative if the bookmakers used a little more caution. According to the present system in use by the Western Union Company, it would be utterly useless for a wire tapper to intercept the messages as they pass to and from the race tracks and the company's main office in this city, because they are all in cipher that is known by two men only. One is the man in the company's office at the race track; the other is the man at the head of the race department at 195 Broadway. The news of positions of the horses is flashed to the city from the tracks for the information of the bookmakers and their customers. No tickets are cashed, however, until confirmation is received. That confirmation comes in cipher. The man at the track arranges the cipher message and sends it to his colleague in New York, who compares it with the preliminary report, and if it tallies he sends it to the pool rooms. It is a perfect system, and it cannot be beaten between the race track and the main office of the company, but it does not prevent the wire tappers from tapping the pool room wires between the telegraph office and the bookmakers' places of business, as described.

The ingenuity of the gang just at present is startling. A week or so ago the gang attempted to tap the wire of a well known bookmaker here. The lineman went to the building in which the pool room is and inquiring for the janitor told him that he had come to repair the wires of the bookmaker. The janitor unlocked the door of the pool room, as it was long after hours, and the lineman deliberately cut the insulated wires which entered the window and ran to the operator's table and carried them out again on a loop of very fine wire. On the following day the discovery that the wire had been tapped was made in a peculiar manner. The sunlight streaming through the window struck the shiny copper wire where the insulation had been cut to make the connection, and the reflection caused the operator who saw it to become suspicious and to make an investigation. The wire tappers had not made an office connection and were not caught.

The telegraph company thought they would be protected partly when they put their wires underground, but they have been disappointed at times. The tappers have tapped a number of wires that run from the telegraph office to the bookmakers' places by entering the buildings in the cellars and running up elevator or light shafts. The tappers traced the wires into the cellar, tapped them, and carried them to another room in the same building or to a room in a building adjoining.

Some wire tappers are bunco operators also. They do not tap the wires always. Sometimes they merely pretend to do so. They approach a man and unfold their plan to him, explaining that they are breaking no law, and that if he will put up the money they will divide the proceeds of their haul. They take the man to a room where they have a complete set of telegraph instruments arranged and tell him that the instruments are connected to a pool room wire. In nine cases out of ten the scheme works, and the victim backs the gang for various amounts, and that is the last he ever sees of his money. The confederate who takes it to place it on a horse never returns, and the victim never complains to the police.

It is understood that the legislature is to be asked to pass a law under which a telegraph company can prosecute the wire tappers. When that is accomplished wire tapping will become a lost art, but not until then, the officials say.

A New Flush Switch.

With this article we illustrate the new flush switch recently designed and put upon the market by the Electric Engineering and Supply Company, Syracuse, N. Y. The time is rapidly approaching when the clumsy devices which have heretofore been tolerated, in connection with electric lighting apparatus will become things of the past. The unsightly humps on the wall, which have for many years answered the purpose for controlling incandescent lamps, will, we think within a very short time, be superseded by switches of a much more beautiful design; and this style of switch we think at least a step in advance of what has heretofore been used for this purpose.

Divine Service by Telephone.

The Mayor of Nottingham, England, accompanied by several members of the corporation and other leading men of the town, attended divine service on Sunday morning, February 28, in a novel fashion. The meeting house was the local exchange of the National Telephone Company, but the service in which they participated was conducted at Christ Church, Birmingham, 51 miles away, the communication being, of course, by telephone. They sat on each side of a long table on which 30 receivers were placed, while at the church end were eight transmitters—two in the belfry, two in the choir, two in the reading desk and two in the pulpit, switched on and off as exigencies required—an arrangement which has been in operation for some weeks for the edification of Birmingham subscribers. The Nottingham congregation were able to hear the bells very distinctly, and the service, the responses and other musical portions, while the preacher, having a clear voice and deliberate utterance, was very audible, and his sermon was listened to with close attention.

TELEGRAPHIC

.... A news item from Plainfield, N. J., says that up to three years ago there was considerable cutting of rates between the New York and New Jersey Telephone and the Western Union Telegraph Companies, and rates for messages from Plainfield, New Brunswick, Perth Amboy and other places, to New York were as low as 15 and even five cents. Three years ago the companies ceased fighting and combined on a schedule of high rates. This contract has just expired, and the telephone company has promptly cut rates 10 cents a message to all directions. It is understood that the telegraph company will make a similar cut. Charles W. Runyon, local manager for the telephone company, says that the company is bound to give the public lower rates than the telegraph people, no matter how low the rates have to be cut. The rate war is to be made general.

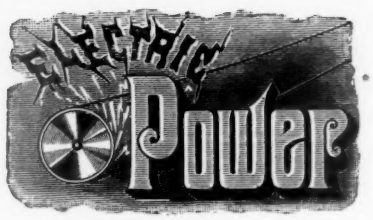
The Contract Annulled Between the Union Pacific and the Western Union.

The contract between the Union Pacific Railroad Company and the Western Union Telegraph Company, by which the latter conducts the commercial telegraph business on the former's lines, must be set aside, according to a decision rendered March 30 by Justice Brewer of the Supreme Court. The case was begun in the Circuit Court for Nebraska, by the title of the United States *vs.* the Western Union and Union Pacific Companies, under the provisions of the act of the Fiftieth Congress, known as the "Anderson law." By that law, railroad and telegraph companies which had been assisted in any way by the United States in the construction of railroad or telegraph lines were required to operate, by their own officers and employés, telegraph lines for all purposes, and exercise by themselves alone all telegraph franchises conferred on them, and the officers of the government were directed to bring suit to annul any contract entered into in violation of the rights conferred upon the companies by the government in the franchises or grants referred to.

Justice Brewer discusses the question at issue at great length and, in summing up, says:

"It is insisted that the practical working of the contract is pecuniarily beneficial to the railway company, and also that the public interests are, in fact, subserved by placing the commercial telegraphic business along this road in the hands of that corporation which practically controls the telegraphic business of the country. Assume that both these contentions are sustainable, and I am inclined to believe that they are, yet I am constrained to hold that, though established, they constitute no defence to the demand of the government. This is a government of the people. They express their will through legislative action. It would disarrange our system of government and would be freighted with peril if the courts attempted to interpose their opinions upon matters of policy, to stay or thwart such constitutionally expressed judgment. It is enough for the courts to protect and enforce rights, without entering into question of policy. So, conceding in respect to these matters all that is claimed by counsel for defendants to be true, I am of opinion that they present no matters into which the court is at liberty to inquire, or which in any manner operate to prevent the enforcement of the declared will of Congress in the act of 1888."

Justice Brewer says, in conclusion: "A decree will therefore be entered in favor of the complainant, setting aside the contract of 1881, and putting an end to the relations created by and subsisting under it between the two defendants; and with it a mandatory injunction upon the railway company to hereafter, by its own agents and employés, and not through the instrumentality of the Western Union Company, exercise all the duties created by the telegraphic franchise of the acts of 1862 and 1864, and directing the latter company to vacate all the offices of the railroad company, with leave to the Western Union Company to apply for and have stated an account between it and the railway company as to the value of its property along the line of the latter's railroads and jointly used by the two companies, and for such other relief as equity and good conscience require."



* * The Yale & Towne Manufacturing Company, Stamford, Conn., are considering the advisability of running their machinery by electricity.

* * Canandaigua, N. Y., will probably substitute electricity in place of horses for the street car service, and hopes to have the road in operation by the first of May.

* * It is reported that a party of Philadelphia capitalists has been in Buffalo looking over the Buffalo and Tonawanda Electric Railroad with a view to buying it.

* * The Lechner Electric Mining Machine Company, of Columbus, O., has filed an assignment. The liabilities are placed between $3,000 and $4,000 and the assets at $10,000 to $12,000.

* * Four electric machines for stamping letters and cancelling stamps are now running in the Chicago post office. Each of these machines stamps 28,000 letters per hour, doing the work of six men.

* * The Thomson-Houston Electric Company is building a 500 horse-power electric locomotive for experimental work on elevated or suburban roads. If it accomplishes the work expected of it successfully, a larger one will be built immediately.

* * Negotiations between the Olympia, Wash., Railway Company and the Olympia Light and Power Company are likely to result in the sale of the former's franchises and street railway to the latter company, which is now constructing its electric line.

* * It is said something like $10,000 have been subscribed by the citizens of Dallastown, Pa., towards raising the $80,000 needed to build an electric motor line from that place to York, and that Harrisburg capitalists will take hold of the project and push it to a successful issue.

* * The Steinway Railroad Company, whose street railway line runs from the Ninety-second street ferry to Steinway, Long Island, has contracted with the Eickemeyer-Field Company, of Yonkers, N. Y., for an electrical equipment. The order calls for six motor cars and two 100 horse-power generators.

* * The Detroit Electrical Works and the American Electrical Works have filed a bill against the Nashville, Tenn., Electric Railway and Power Company, to recover a debt of $1,699.14 due the Detroit company, and $73.75 due the American Works. The bill seeks to have all of the subscribers to stock whose subscriptions are unpaid brought into court.

* * A large flour mill is now being erected in St. Paul, Minn., which will be operated entirely by electricity, the power for generating the current being furnished by the water in the falls of the Mississippi River. If the experiment turns out as successful as is anticipated, all the larger mills of St. Paul and Minneapolis will hereafter use electricity as a motive power.

* * The creditors of the Allen & Swine Electric Street Railway Company, of Dubuque, Iowa, have applied to the court for the appointment of a receiver, alleging that $95,000 of the company's money has been misappropriated; that there is a shortage of $35,000 in the cash account, and that this money has gone to bolster up the lines in Davenport, Iowa, and Stillwater, Minn.

New York Electric Club.

A meeting of the members of the Electric Club, to nominate officers and a board of managers for the ensuing year, will be held at the Club House, 17 East Twenty-second street, Thursday evening, April 7, at 8 o'clock.

An Electric Drilling Machine.

Messrs. Collet & Engelhard, of Offenbach-on-the-Main, have brought out an electric drilling machine, of which we give an illustration herewith. The pillar contains a 110 volt 1½ horse-power motor, which takes the place of the ordinary belt. There is, of course, no real difficulty in driving all machine tools by means of motors incorporated in them, but this method is not worked out as it ought to be in this country. Messrs. Collet & Engelhard, for instance, make electrical cranes and all kinds of electric machine tools. This method of driving must supplant leather belts sooner or later, and mechanical engineers should give the matter their careful attention when fitting up new shops.

FIG. 1.—THOMSON-HOUSTON FOCUSING LAMP WITH TURN-TABLE. (See Opposite Page.)

The following editorial comment on this machine is made by London *Industries*, to whom we are indebted for our illustration:

In our present issue we illustrate a radial drilling machine made by a German firm, and we would call the attention of machine shop managers to the great superiority of electrical transmission of power over that by belting. It is commonly supposed that electric motors are chiefly suitable for transmission of power over long distances. This is not the case, however, and the time is now come when it will pay to use copper conductors instead of belting, even in small factories.

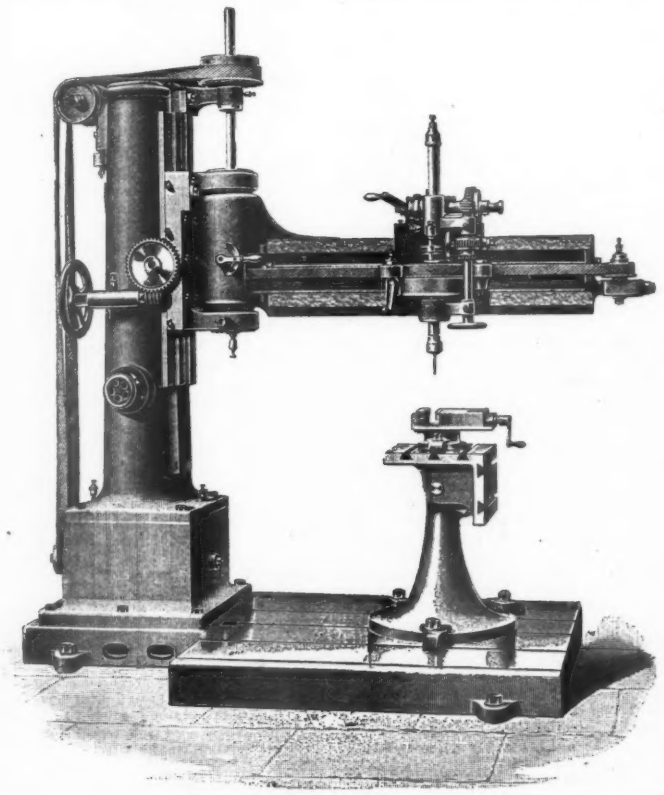
The first objection that will be raised is on the score of expense. But it must be remembered that a very much smaller steam plant is needed. In driving a large machine shop the waste of power in the shafting is really enormous. When all the machines are in use, the efficiency of transmission through many countershafts is very low, and in practice very few machines are doing heavy work simultaneously. At any one time a large proportion of the machine tools in a shop are either having work taken off or put on them, or are taking light finishing cuts. In an electrical system the dynamo has to supply only the power actually needed, so that quite a small engine and dynamo will drive a large shop. The small engine and dynamo will probably cost less than the large engine now necessary.

Coming, now, to the motors, they need not be large. It is surprising to many to find what a little power will drive a large tool. The motors will, no doubt, cost more than the usual speed pulleys and countershafts, but not much more. It is questionable whether the whole cost of the motors and conductors would be as great as that of the shafting and belting now used. Speed cones are unnecessary, as the motor can be mounted as part of the machine, and if direct currents are used it can be fed under different pressures, or, if alternating motors are employed, circuits of various frequencies can be employed. The advantages of such an electrical system are that the forest of belting, with its attendant turmoil, is done away with, and a clear space is allowed for overhead cranes. A great part of the shaking and jarring is due to belting, so that with motors the machinery will run smoothly and noiselessly. The attention needed will be much smaller, as the whole of the overhead gear is done away with, and the motors are within reach of the machine attendant. If multiple current motors are employed, no commutators are necessary, and the motors thus add no working surfaces to the machines.

The next advantage is a large saving in the coal bill. The whole of the works can be run from one engine and boiler room of comparatively small size—placed conveniently as to coal, water and position. This in itself means a great saving in capital, coal, labor and space. In most engineering works there is an engine for each building, and various small engines running punching and shearing machines and hydraulic pumps. Sometimes special engines are used for traveling cranes or traversing platforms. An overhead crane driven by shafting or by ropes has often a very low efficiency, as measured from the weight raised. It is hardly necessary to add that the same plant, if made larger, would do for lighting the works at night. The electric light, on any moderate scale, is far cheaper than gas, and it is more convenient, as, by means of flexible conductors, it can be put in any position to suit the workman. The days of tallow "dips," stuck in ⅝-inch nuts, are numbered. If alternating currents are employed, electrical welding is available wherever it is wanted, and the ordinary forges can gradually be replaced by electrical heating as workmen become better educated in these matters.

We must not overlook another advantag with direct currents, and that is constan speed. In many mills there is the greates difficulty in keeping the speed constan enough for spinning. All sorts of governors have been devised. All this is avoided by the use of motors. A direct current motor will run at constant speed, even if the main engine and dynamo vary. The speed of such a motor is also independent of its own load.

It is scarcely to be expected that works managers will remove their belts and countershafting to replace them by motors in existing shops; but before making any further extensions it would be wise to consider the motor and lighting question carefully, and this we feel sure will result in adopting motors, and eventually in the gradual replacing of belts throughout the works.



AN ELECTRIC DRILLING MACHINE.

LITERARY.

Edward G. Mason, of Chicago, contributes a scholarly and valuable article to the April *New England Magazine* on "The Early Visitors to Chicago." It is finely illustrated.

"Our Common Roads," by Isaac B. Potter, is the subject of the opening illustrated article in the April *Century*. Nothing could more vividly depict the wrong way to do it than some of the striking illustrations of this paper, while the right way is also fully pictured and described. This is a subject which interests not only farmers, but all who go on wheels, whether propelled by horse-power or man-power. The cause of good common roads is one that especially appeals to the numerous army of bicyclers.

Mrs. Gladstone, the wife of the famous British statesman, in the first of her articles, "Hints from a Mother's Life," gives much valuable advice in the April *Ladies' Home Journal*, which comes promptly to its hundreds of thousands of readers in a dainty Easter cover of pink. The magazine opens with a full page illustration by W. Hamilton Gibson of an exquisite poem by Eugene Field, entitled "The Singing in God's-Acre." The poem only serves to intensify interest in Mr. John Ballantyne's delightful sketch, with photograph, of the poet's wife, in the series of "Unknown Wives of Well Known Men."

Excluding from mention the many continued stories and articles—of which, however, it may be remarked, there are three serials by popular authors, each worthy of attention because of some special feature, and two other papers in series—we find in the April *St. Nicholas* plenty of attractions. The frontispiece, after a painting by Couture, and the artistic pictures of Mary Hallock Foote, illustrating her vivid sketch of life in the Great West—where many of her young readers will, no doubt, find themselves some years hence—are of unusual excellence. "The Lark's Secret" is a poetic bit of simple writing containing a bit of truth worth remembering, and illustrated in the spirit in which it is written.

Thomson-Houston Apparatus.

The Thomson-Houston Electric Company equip their arc light dynamos with the ring armature illustrated in Fig. 2. They offer many advantages in good ventilation and high insulation, and are of such construction that great freedom from burning out is assured. It is an easy matter to replace a coil in which a fault may have developed. In

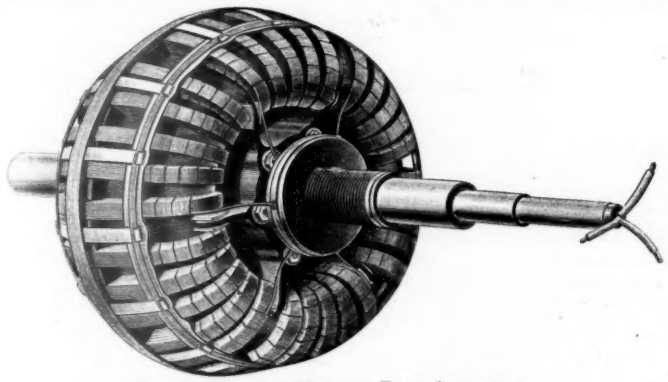


FIG. 2.—THOMSON-HOUSTON RING ARMATURE.

the Thomson-Houston focusing lamp the feeding of the carbons is effected automatically and in such proportion that the arc, instead of lowering gradually, as in the ordinary arc lamp, is maintained at a fixed point. The attainment of this condition of feeding and regulation renders it possible to keep the arc absolutely fixed in the focus of a reflector, and thereby adapts the electric light to the illumination of large areas in building and engineering operations, and for public assemblies, stage effects, stereopticon and photographic work, and many other situations where it is desirable to avoid the difficulties and expense attending the use of the calcium burner. The lamps are made from 1,200 to 12,000 candle-power, and in five styles.

Morse and Vail.

TO THE EDITOR OF ELECTRICAL REVIEW:

I have read with considerable amusement the communication of Mr. G. C. Maynard, in your issue of the 26th inst., in which he endeavors to establish the status of a newspaper correspondent as being that of one in whose writings the reader has no reason to expect any mention of facts, except such as the correspondent may desire to have known.

I am somewhat inclined to think that Mr. Maynard has allowed his personal feeling to obtain the better of his sense of justice, for he writes: "In regard to Mr. Vail's assault upon the reputation and character of Prof. Morse and his *assumption* that, because he painted portraits and was poor, *he could not have been an inventor*, etc." Would an unprejudiced reading of my remarks permit of such a construction? I think not.

I should like to ask why, if Mr. Maynard knew, as he states he does, "something of the *very important* part Alfred Vail took in making the telegraph a practical success," he, in his article, utterly and absolutely ignored any mention of the period of time, June, 1837 (when my father and Morse entered into a partnership contract, and when my father, taking Morse's crude and impracticable device and dictionary, thrust them aside and made an entirely new apparatus and alphabet), to 1843, when Congress passed an appropriation for building the first line, and why the only mention of Alfred Vail (who had taken such a "*very important part*") made by Mr. Maynard in his entire article was that of his being the "operator" at Baltimore when that line was finished?

Permit me, for Mr. Maynard's benefit, to quote the remarks of Hon. Amos Kendall: "If justice be done, the name of Alfred Vail will, *forever*, stand associated with that of S. F. B. Morse in the history and introduction into public use of the electro-magnetic telegraph."

I thank you, Mr. Editor, for your courtesy, and with the assurance that I shall not again trespass upon the columns of your valuable journal, I remain,

Very sincerely yours,
STEPHEN VAIL.

New York, March 29, 1892.

The Short Electric Railway Company.

The annual meeting of the stockholders of the Short Electric Railway Company and the usual directors' meeting following were held at the office of the company, at Cleveland, March 16. The following directors were elected: Sidney H. Short, Myron T. Herrick, J. Potter, John S. Bartlett, James Parmelee, Eugene Griffin and William B. Bolton. The directors met and elected the following officers for the ensuing year: J. Potter, president; S. H. Short, vice-president and chief electrician; Charles B. Lothrop, secretary and treasurer; E. E. Higgins, general manager; William B. Bolton, general counsel. Mr. S. H. Short, who has been, from the organization of the company,

FIG. 3.—THOMSON HOUSTON FOCUSING LAMP.

its president and chief electrician, was renominated for the presidency, but declined to accept the position. He stated that, owing to the growth of the company, its duties had now become so onorous as to seriously interfere with his technical work and inventions, to which he desired to give his undivided attention. He, therefore, asked relief from his general business cares.

—— Dresden, O., has voted to bond the town for $5,000 for electric lights.

What is Now Needed for War.

"These are great days, great days," he mused, "with the telegraph, the mile-a-minute trains, the ocean greyhounds, and the rapid-firing guns.

"Now, years ago," he went on, absentmindedly, "men used to travel in wagons and on foot; and they went to war with bows and spears, but now its all different."

"All different," echoed the smart young man. "Years ago if one went to war he carried a ton of armor. One wouldn't do it now."

"No; no, indeed," mused the old gentleman. "He'd be an inspired idiot if he did. Young man, you've studied up a little on the progress in sciences; what would you do if you had to prepare for a great war?"

"Well," said the smart young man, becoming thoughtful, "of course, I'd get the finest equipment for my army that money could buy—repeating rifles and all that."

"Yes."

"And I'd get a navy that would be out of sight—well armored and with big and rapid-firing guns."

"Yes."

"And I'd look well after provisions. An army is no good if you can't feed it, of course. Then one needs good commanders. I'd get generals who had made a study of the art of war with all the modern appliances. They're essential."

"But they wouldn't be in it with my man."

"Who'd you get?"

"An electrician, young man; a good, smart electrician; and he'd knock your generals silly. He's the war man of today."—*Chicago Tribune.*

—— The Brush Electric Engineering Company, of London, England, has just secured a contract for furnishing a large arc electric light plant for the city of Worcester, England, for the purpose of lighting the city. There were upwards of 10 competitors.

ELECTRIC LIGHT NEWS

—— Coatesville, Pa., is making preparations to establish an electric light plant to be controlled by the borough.

—— The Holton, Kas., Electric Light Company has been compelled to shut down the plant permanently, owing to lack of business.

—— At the annual meeting of the stockholders of the Fall River Electric Light Company a dividend of one and one-half per cent. was declared, payable April 1.

—— A project is on foot in Montgomery county, N. Y., to establish an electric light plant at Palatine Church, to supply electricity to St. Johnsville, Fort Plain, Nelliston, Palatine Bridge and Canajoharie. Water power will be used and it is proposed to organize a stock company with a capital of $75,000.

—— The Baltimore & Ohio Railroad Company are now putting up a building in Pittsburgh, Pa., 33x81 feet, which will contain their plant for lighting the passenger and freight depots and city yards by electricity. The Thomson-Houston system will be used, and 150 arc and 450 incandescent lights operated.

—— Messrs. Siemens & Halske, of Berlin, have secured the contract for the erection of a central electric station in the town of Grosseto, Italy, the current to be used both for the public and private lighting. Water power, situated at a distance of about two miles from the town, is to be used in the generation of the current.

—— A local union of the National Brotherhood of Electrical Workers was organized at Kansas City, Mo., last week by the election of the following officers: President, A. M. Barron; vice-president, L. H. Gamp; recording secretary, F. M. Greene; financial secretary, F. M. Rose; inspector, C. E. Baggs; foreman, J. J. Callahan; treasurer, C. F. Drollinger.

—— The Brush Electric Lighting Company, of Lafayette, Ind., have recently secured a new five years' contract with the city at an advance of $25 per light over the old contract. The following officers of the company were recently elected: S. M. Hamill, Cleveland, Ohio, president; William Wallace, Lafayette, vice-president; John O. Morgan, Lafayette, secretary and treasurer; R. H. McMullen, Lafayette, manager.

—— At an adjourned town meeting, held in Melrose, Mass., last week, the important subject considered was the establishment by the town of an electric lighting plant. There was no debate, the proposition being to borrow $75,000 on 30 year bonds for the electric plant. The votes cast numbered 234, of which 152 were in the affirmative and 82 in the negative. The affirmative vote was less than the required two-thirds by four votes and the motion was lost. A reconsideration will take place this week, when the advocates of the proposition will try and rally enough votes to win.

—— The Indianapolis Brush Electric Light and Power Company, of Indianapolis, Ind., recently elected the following directors: John Caven, Indianapolis; J. Potter, Cleveland, Ohio; S. M. Hamill, Cleveland, Ohio. The following officers were also elected: John Caven, president; J. Potter, treasurer; S. M. Hamill, secretary. A 10 years' contract was made with the city for seven hundred and fifty 2,000 candle-power arc lights. Heretofore, the city had only used about one hundred and fifty 2,000 candle-power arc lights. They expect that 750 arc lights will light the whole city, and that it will not be necessary to use any more gas.

American Bell Telephone Company's Annual Meeting.

The annual meeting of the board of directors of the American Bell Telephone Company was held at the offices of the company in Boston, March 29. Mr. Chas. Eustis Hubbard was elected clerk and Mr. Wm. R. Driver treasurer. Directors were elected as follows: Thomas B. Bailey, Francis Blake, Chas. P. Bowditch, Geo. L. Bradley, Alex. Cochrane, Wm. H. Forbes, Henry S. Howe, Chas. Eustis Hubbard, Gardiner G. Hubbard, John E. Hudson, Chas. E. Perkins and Thos. Sanders.

The capital stock of the company was increased $2,500,000, making $17,500,000 in all.

The annual report of the board of directors for the year ending December 31, 1891, follows:

The summary of the output of telephones for each year since 1888, and the consolidated statistics from the reports of companies operating under our licenses are here given in the usual form for facility of reference, and are as follows:

Instruments.

	Dec. 30, 1884.	Dec. 30, 1885.	Dec. 30, 1886.	Dec. 30, 1887.	Dec. 30, 1888.	Dec. 30, 1889.	Dec. 30, 1890.	Dec. 30, 1891.
In the hands of Licensees, under rental	325,574	330,040	353,518	380,277	411,511	444,861	484,790	512,407
Increase over previous year	.....	4,466	23,478	26,759	31,234	32,350	38,929	28,617

Exchanges.

	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	Increase over 1891.
Exchanges	906	772	747	736	739	742	757	774	788	14
Branches	419	481	428	446	452	452	471	467	509	42
Miles of Wire on poles	.....	88,481	100,332	111,349	127,839	142,631	154,009	171,498	180,139	8,641
Miles of Wire on Buildings	.....	11,886	10,043	10,587	10,225	10,266	11,484	13,445	14,954	1,509
Miles of Wire Underground	.....	1,225	3,417	6,030	8,009	17,038	27,117	54,690	70,334	15,644
Miles of Wire Submarine	.....	.....	254	265	365	536	603	779	1,029	250
Total Miles of Wire	85,896	101,592	114,046	128,231	146,438	170,471	193,213	240,412	266,456	26,044
Total Circuits	97,422	107,440	112,067	121,260	132,004	143,687	156,780	173,665	186,462	12,797
Total Employés	4,762	5,168	5,438	5,843	6,183	6,310	6,758	7,845	8,376	531
Total Stations	123,625	134,847	137,750	147,068	158,712	171,454	185,003	202,931	216,017	13,086

Exchange Connections.

The estimated number of exchange connections daily in the United States, made up from actual count in most of the exchanges, is 1,584,712, or a total per year exceeding 500,000,000.

The number of daily calls per station varies in different exchanges from 2 to 16, the average throughout the United States being 7⅓, which shows an increase from last year in the average use made of the telephone by each subscriber of about 3½ per cent.

The average cost to the subscriber varies, according to the size of the exchange and character of the service, from less than 2 to 13 cents per connection.

Toll Connections.

The average daily number of toll connections is 33,776, or a total per year of about 11,000,000; the toll revenue reported by all companies for the year 1891 was $1,638,653.29*; earnings of extra-territorial lines included in the above sum amounted to $763,358.71*, of which last item this company's share is $96,142.33; an increase over 1890 of $4,881.16.

Reports received from the various companies operating exchanges and lines throughout the United States show a satisfactory growth of the business, and an activity, which was never more marked than at present, in making extensions and improvements of plant of such character as to ensure the best results in the way of effective and uninterrupted service.

A steady increase is recorded year by year in the number of connections required daily by each subscriber with other stations of his exchange, taking for comparison the successive averages of such calls throughout the country. The fact that this average of use has increased 35 per cent. within the last six years is an indication of the constantly growing value which the subscriber finds in the service of the telephone system.

While the net gain of 13,086 subscribers during 1891 is somewhat less than that of the preceding year, which is due in some measure to the severe and destructive sleet storms which visited several States in the early months of the year, it is still well above the average of the past seven years, and a large part of the increase represents subscribers for metallic circuit stations. With the advantages which this class of service affords, especially in places where trouble is experienced from the interference of strong electric currents, a largely extended use of this system is to be looked for in the near future.

As is shown in the preceding table of exchange statistics, more than half of the increased mileage of exchange wire is in the form of underground conductors. There are now in operation 70,000 miles of underground wire, which is more than one-fourth of the entire exchange mileage in the country. While the use of this class of construction will, of necessity, be restricted in the main to the closely built sections of the larger cities, considerable extensions of the system are in progress, and the work of laying conduits and underground cable will this year be undertaken in several exchanges other than those named in the foregoing list.

The entire expenditure during 1891, reported by our licensees, for new lines and equipment was $4,347,317.35; and for cost of land and buildings $800,793.93.

The construction work of the "Long Line" Company—the American Telephone and Telegraph Company—in the completion and extension of its system, has included the building of a pole line from Pittsburgh to Harrisburg, and of a pole line from Altoona to Hazleton, and also a line westward from Pittsburgh to Cleveland by the way of New Castle. There have also been strung 10 additional wires on the lines between New York and Philadelphia; and at various points minor additions of wire have been made to meet the growing demands of the business.

The total construction amounted to 463 miles of pole line; 4,942 miles of wire.

It is the intention, during the course of the current year, to fill the gap between Cleveland, Ohio, and Hammond, Illinois, which last named place is already connected by the long lines with Chicago; thus giving through service between Boston, New York and Chicago.

On the 17th of November a patent was granted to the company, as assignee of Émile Berliner, for a combined telegraph and telephone. The patent embraces a claim for the microphone, and would have issued long since, except for the interfering applications of Drawbaugh. Every attempt to obtain the Berliner patent was met by the statement of the patent office examiners that it was withheld for a possible interference. It was presumed by our attorneys that the interfering party was Drawbaugh, and the attention of successive commissioners of patents was repeatedly called to documentary evidence in the patent office, proving that the Berliner invention was in public use for more than two years before Drawbaugh made application for patents. On the 28th of October last, upon evidence taken in a proceeding to which Drawbaugh was a party, the present commissioner of patents finally rejected the Drawbaugh application, saying, in a published decision, that "it is found that the improvement in controversy was in public use and on sale more than two years prior to the time when Drawbaugh filed his application for patent under consideration, and that for such reason he is not entitled to a patent therefor." A few days afterwards the Berliner patent was ordered to issue.

The decision of the commissioner of patents in the Drawbaugh case finally disposes of the Drawbaugh application, so far as the patent office is concerned.

In the government case (*United States* vs. *The American Bell Telephone Company and Alexander Graham Bell*), the evidence for the government was closed on the 11th of January, 1892, after 103 witnesses had been examined, and nearly two years had been occupied in taking their testimony. Application has been made to the court for time within which to take evidence on behalf of the respondents, and we have been allowed until October 1, 1892, for that purpose, with the understanding that if it be decided to introduce evidence to meet the testimony relating to Daniel Drawbaugh, further time will be required.

In the case of *The Western Union Telegraph Company* vs. *The American Bell Telephone Company*, it will be remembered that the master, the Hon. John Lowell, found in his report that the plaintiffs were not entitled to the account asked for. The plaintiffs have moved for leave to dismiss their suit without prejudice. The motion has been argued, but has not yet been decided.

The electrical department, the patent division and the mechanical department have been much called upon during the year in their several lines for advice, information and experiment. The great additions constantly being made to the sum of electrical knowledge and the rapid increase in the number of patents issued for electrical inventions, adds to their work; the various branches of this knowledge being so interrelated that it is not wise not to keep a lookout over the whole field, while, of course, giving particular attention to such matters as particularly concern our own business.

The ledger balances, as they stood on December 31, 1891, and a statement of the earnings and expenses in detail and in comparison with the earnings and expenses of the year 1890, are shown in the treasurer's statements, which are appended. There are also appended the reports of the committee on accounts of April 11, July 16, October 13, 1891, and February 17, 1892.

For the directors,

JOHN E. HUDSON,
President.

Ledger Balances December 31, 1891.

DEBTORS.

Telephones	$979,116 86
Real estate	933,130 66
Stocks	33,180,409 03
Merchandise and machinery	8,884 96
Bills and accounts receivable	3,192,912 71
Cash and deposits	655,823 00
	$38,950,277 22

CREDITORS.

Capital stock	$15,000,000 00
Debenture bonds, 1888	2,000,000 00
Bills and accounts payable*	848,908 60
Patent account (profit and loss)	10,274,913 46
Profit and loss	5,688,566 78
Reserve	2,986,876 77
Surplus	2,151,011 61
	$38,950,277 22

* Of this amount $450,000 is the dividend payable January 15, 1892, to stockholders of record December 31, 1891.

Comparative Statement of Earnings and Expenses.

EARNINGS.

	1890.	1891.
Rental of telephones	$2,913,368 63	$3,127,788 01
Dividends	1,256,274 19	1,320,645 92
Commission from Ex. Ter. lines	89,478 13	91,280 73
Commission from Teleg. business	26,491 60	27,844 89
Real estate		16,326 76
Interest	77,447 89	145,159 63
Miscellaneous	12,230 44	6,965 72
	$4,375,290 88	$6,736,006 66

EXPENSES.

Expenses of operation	$311,437 98	$332,996 05
Legal expenses	123,359 08	74,603 69
Real estate		29,062 72
Interest and taxes	257,174 85	309,109 02
Commission	575,221 03	614,019 06
Royalty	10,000 00	10,000 00
Concessions	228,573 94	239,395 62
Miscellaneous	105 65	
	$1,505,872 53	$1,609,186 76
Net earnings	$2,869,418 35	$3,126,819 90

Extra-Territorial and Toll Lines.

	Jan. 1, 1884.	Jan. 1, 1885.	Jan. 1, 1886.	Jan. 1, 1887.	Jan. 1, 1888.	Jan. 1, 1889.	Jan. 1, 1890.	Jan. 1, 1891.	Jan. 1, 1892.	Increase.
Miles of pole lines	20,592	25,766	30,697	31,143	32,478	34,010	35,254	35,541	41,298	5,757
Miles of wire	29,359	35,631	41,745	43,767	56,179	73,293	86,728	91,230	115,088	23,858

Heretofore the mileage of extra-territorial lines only (lines connecting exchange systems) has been shown in this table. The report for this year includes with this the mileage of lines connecting different cities or towns within the same exchange limits. In the apparent increase of line mileage there are included about 15,731 miles which have before been in use, but are not operated under extra-territorial contracts.

Surplus account Dec. 31, 1890	$2,151,011 61	
Net earnings, 1891	3,126,819 90	
		$5,277,831 51
Regular dividends, 1891	$1,725,000 00	
Extra dividend, 1891	900,000 00	
Reserve for general depreciation	400,000 00	
Reserve for depreciation of instruments	101,819 90	
		3,126,819 90
Surplus account Dec. 31, 1891		$2,151,011 61

Underground Wires in Use.

	Jan. 1, 1886. Miles.	Jan. 1, 1887. Miles.	Jan. 1, 1888. Miles.	Jan. 1, 1889. Miles.	Jan. 1, 1890. Miles.	Jan. 1, 1891. Miles.	Jan. 1, 1892. Miles.	Increase over 1891. Miles.
Albany, N. Y	.....	1	1	1	1	1	0	Loss 1
Aurora, Ill	.....	.....	.....	.....	.....	4	4	.....
Baltimore, Md	.....	.....	.....	.....	.....	2,708	4,295	1,587
Boston, Mass	289	347	736	1,580	3,599	5,485	7,680	2,195
Bridgeport, Conn	.....	.....	.....	.....	.....	.....	425	425
Brooklyn, N. Y	134	1,233	1,443	2,197	2,254	4,199	4,542	343
Buffalo, N. Y	.....	.....	.....	.....	1,170	1,414	1,756	342
Cambridge, Mass	.....	.....	.....	.....	.....	275	275	.....
Chicago, Ill	760	1,462	2,000	3,127	3,255	6,444	7,288	844
Cleveland, O	.....	.....	.....	.....	.....	595	645	50
Denver, Colo	.....	.....	.....	.....	.....	1,175	1,175	.....
Detroit, Mich	.....	82	175	500	871	1,101	1,145	44
Hartford, Conn	.....	.....	.....	.....	.....	.....	769	769
Louisville, Ky	.....	9	238	469	780	1,114	1,182	68
Lowell, Mass	.....	.....	.....	.....	4	150	165	15
Milwaukee, Wis	1	1	.....	.....	.....	1,047	2,165	1,118
Minneapolis, Minn	.....	.....	.....	.....	.....	734	1,029	295
New Haven, Conn	.....	.....	.....	.....	300	546	832	286
New York, N. Y	627	627	1,120	5,203	10,900	22,507	26,881	4,374
Orange, N. J	.....	.....	.....	.....	.....	.....	6	.....
Philadelphia, Pa	.....	.....	.....	.....	.....	.....	1,457	1,457
Pittsburgh, Pa	614	966	958	2,370	2,394	2,868	2,920	52
Rochester, N. Y	.....	.....	.....	.....	.....	110	242	132
San Francisco, Cal	.....	.....	.....	.....	.....	.....	985	985
St. Paul, Minn	.....	.....	.....	.....	.....	580	759	179
Washington, D. C	992	1,302	1,338	1,591	1,589	1,633	1,764	131
	3,417	6,030	8,009	17,038	27,117	54,690	70,386	15,696
American Telephone and Telegraph Company's long distance wires	.....	.....	140	327	559	1,133	1,120	Loss 13
Total	3,417	6,030	8,149	17,365	27,676	55,823	71,506	15,683

* Not including herein earnings of the American Telephone and Telegraph Company, $437,828.61, gross.

An Enterprising Baker.

Here is a first-class story of local enterprise which comes direct from Truro.

In the streets of that town are conduits of running water, like unto those well known of Cambridge men as the rivers Pot and Penn, for carrying off all manner of refuse. These conduits were till recently in such extremely bad repair that the water, which came down in considerable volume, used alternately to flood the streets and wash away the drains.

The corporation had no money for repairs, and were as much at their wits' end as the burghers of Hamelin with the plague of rats. Suddenly there dropped from the skies another "Pied Piper," in the shape of a poor, but honest, baker of bread, who offered to renew the whole system of drainage if he might have the use of the water which was thereby carried away.

With a haste rare in such matters, the agreement was drawn up, signed and concluded upon the spot, and, armed with unlimited powers for an indefinite number of years, that baker borrowed money, rebuilt the culverts and took the whole of the water through his own back cellars, low down at the bottom of the town.

There he installed an undershot wheel, a dynamo and a battery of accumulators, from which he lighted his shop.

The next step was to canvass his neighbors privately and, pointing out the damage done to their goods by gas, to offer to supply them with sufficient light for the amount of their annual gas bills, a move which also succeeded beyond all expectation. And there is the baker now supplying a whole district with as much efficiency as profit, and there is the Truro corporation gnashing its teeth and wondering how on earth to find a flaw in the agreement.

You cannot hire a drain or water pipe in Truro now for all its weight in gold.—*London Lightning.*

Note on the Molecular Movement in a Conductor.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, FEBRUARY 16, 1892, BY PROF. A. E. DOLBEAR.

Maxwell and others have made experiments to discover whether there was any evidence of momentum in a conductor carrying an electric current. So far as I know, all the experimenters looked for a *longitudinal* momentum, that is, one in the direction of the current in the conductor, but no evidence appears to have been discovered that the molecules are thus moved. Still it is as near certain as anything can be and not be demonstrated, that the molecules in a conductor are moved in some way by an electric current. If they be thus moved then there must be momentum in some direction. If it be not longitudinal it may be transverse. If there should be movement in the transverse direction, what kind of experiments would be needed to show it? This is the way the question presented itself to me. When a current is sent through an *iron* wire the latter is twisted to the right or the left, according to the direction of the current. This is interpreted as due to the specific magnetic quality of the conductor, for it does not occur in a copper or other conductor.

Suppose the molecules of a conductor to be *rotated*, each upon its own axis, the axis being longitudinal with the wire, what evidence of such motion would be externally exhibited by the conductor as a whole? Evidently it would be masked altogether in a common wire, for the momentum of any one molecule in one direction would be just balanced by that of the contiguous one in the opposite direction—a condition of things mechanically propagated through the diameter of the wire. In order to discover it, it would be necessary to prevent such mechanical transference of the movement, and this can be done by making the conductor a hollow cylinder. I, therefore, made a cylinder of gilt paper about 20 inches long and four inches in diameter, this I provided at each end with a bail for suspension, thus: The suspending wire being eight or ten feet long, the lower end of a short wire dipping into a mercury cup, as shown in Fig. 1. With this arrangement a decided evidence of twist could be noticed, but on account of the resistance of the gilt paper, a strong current could not be used without so high a voltage that the paper took fire several times. I then had a thin copper cylinder made of nearly the same dimensions and suspended in a similar manner, and could use a current of 30 or 40 amperes. The rotary motions were in the same directions as before, namely—when the current was going down, the twist was always right handed, as indicated by the arrow, and, of course, opposite when the current was reversed. While there was no doubt about the rotary movement, the weight of the apparatus was so great, I concluded to see if one made of lighter material, aluminium, would not give greater amplitude with same current. A similar cylinder of aluminium foil was prepared and so hung that all tangential movement would be due solely to itself and not at all to any other part of the apparatus, that is, it was mounted with bi-filar suspension. The weight of the foil with its connections were 1.85 ounces, 55.6 grammes. A bit of mirror was fastened to the upper end, and a beam of sunlight reflected from it upon a scale 16 feet distant and 25 feet long. (See Fig. 2.) With this arrangement, the twist produced by the current was such that it was not difficult, by timing the swings and changing the direction of the current, to make the cylinder swing through 90 degrees. A current of 15 amperes swung it through a foot and a half of the scale. It would come to rest at about half the distance of the greatest amplitude of the swing for each different current employed, and, *therefore, showed the continuous action of the torsional force for a constant current.* If this be the interpretation of the phenomenon, then the molecules are rotating when there is a constant current, and thus the explanation of the heating effect of the current is brought back to dynamical and mechanical principles. Adjacent molecules must be rotating in opposite directions at their point of contact, but this vibrating or heat motion necessitates more or less separation when such rotation goes on; on impact it is arrested, so there must be impact and slip, the arrest of motion being the immediate antecedent of the heat, as is friction in any case. These experiments have not been carried out quantitatively for lack of

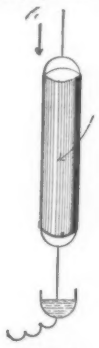


FIG. 1.

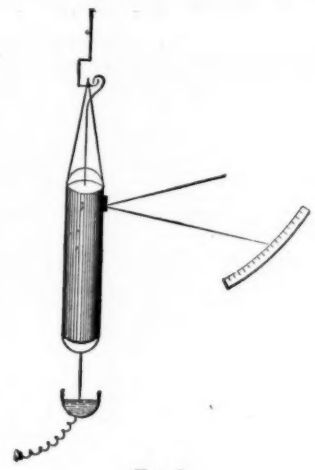


FIG. 2.

facilities. Maybe the interpretation is wrong, and some wise man who knows all about it can point out its inadequacy. I think the experiments are new, and may lead to an understanding of what goes on in a conductor when a current of electricity traverses it, if this be not the whole of it.

In discussing the paper, Mr. C. O. Mailloux thought that the horizontal component of the earth's magnetism might have had a great deal to do with the rotation, and that the experiment is not conclusive until it shall have been tried in different relations with respect to the earth's magnetism and the effect of different magnetic fields in its neighborhood has been tested. Since the current travels in a vertical direction and the lines of force form circles concentric with its line of motion, it was quite evident that any magnetic field, however feeble, must have some effect upon the conductor.

Mr. Townsend Wolcott thought, if the tube were perfectly straight and perfectly uniform in resistance, there was no reason for a continuous rotation, but if the tube were crooked it might revolve partially.

Mr. Kennelly pointed out that if that particular cylinder did turn it was reasonable to suppose that another cylinder inside, concentric with it, would also independently turn, a third one within that would also turn, and so on; and if they would each and all separately turn, surely, when they are united in one solid mass, the whole mass would revolve.

Dr. Pupin called attention to an experiment made some years ago by Professor Braun, of the University of Tubingen. He found that a wire made of a magnetizable substance when twisted one way will generate an electromotive force acting in one direction, and if twisted the opposite way it will produce an electromotive force acting in the opposite direction. Perhaps the phenomenon observed in Professor Dolbear's interesting experiment was due to a similar cause.

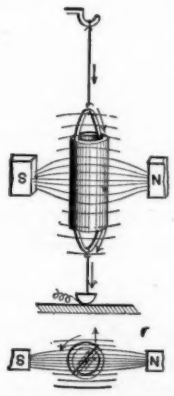


FIG. 3.

Mr. Harold Binney thought the balls might be responsible for the phenomenon—the current in passing downwards would go more in one bail than in another, owing to its tendency to lateral shifting in the magnetic field. In that case, in starting to go downward, it would, say, go more in the right hand bail, and if that bail were not exactly perpendicular to the lines of force it would tend to shift it across the field of force and so cause rotation. (See Fig. 3.)

The Chairman, Vice-President Crocker, thought if one side was a little thicker than the other, the current would be stronger on that side. That would throw it out of balance and cause rotation; but if it were perfectly symmetrical, there would be no tendency to rotate.

Mr. Carl Hering suggested that some interesting results might be obtained if that conducting cylinder were surrounded by a fixed iron cylinder. This would shield it from the earth's field, and if the motion was due to the magnetic lines circulating around that conductor, the effect would be increased, because of the iron cylinder which increases these magnetic lines.

Mr. Chas. J. Kintner suggested a modified form of the apparatus. Instead of a metallic cylinder, suppose we take a light glass cylinder, Fig. 4, and attach in some way a porous diaphragm through the center thereof, with mercury at the bottom and a wire running upwards into the mercury, connected at one pole of the generator, and with a conductor running from above into two liquids, a colored liquid on one side of the diaphragm and a perfectly transparent liquid on the other. If there be any tendency to molecular movement there, it is possible the colored fluid would be forced to rotate through the diaphragm and mix with the transparent liquid.

The Trolley and the Press.

They yield ungracefully to the inevitable, as the following editorial, cut from a leading New York daily, will indicate:

"Brooklyn is to be cursed with a trolley system. The people seem to like it and the Railroad Commission permits them to have their way."

In our February issue we expressed surprise that the New York papers, which ordinarily treat public themes with great dignity and fairness, should lose their heads when treating on the trolley system, and continue to parade the danger spook after it had been shown over and over again that their utterances in this direction were based on ignorance and misconception. It is time now for the papers to recognize the fact that the people do like the trolley system, that they are bound to have it, and they regard it in the light of a great blessing rather than a curse. Such flings as the above are undignified, and while they may do for a street gamin who has been worsted in an encounter with his fellow, they indicate a mind too narrow to deal intelligently with questions so vital to the well-being of the people of a great city. It is unfortunate for the reputation of the public press that it has generally opposed the introduction of electric traction, and had it not been for the technical press there would not be a car wheel turned by electricity in any city of our Union. We would not call attention to this unpleasant fact, were it not that in certain localities the same farce is being again enacted. Papers with a national reputation are bending their energies to prevent the introduction of the trolley in a neighboring city, with inevitable defeat staring them in the face. It would save much humiliation on their part and much trouble in street railway circles if such publications would join the party of progress and lend a hand in the development of these industries which promise so much for the comfort of thousands of people and an enormous increase in the value of real estate.—*Street Railway Journal.*

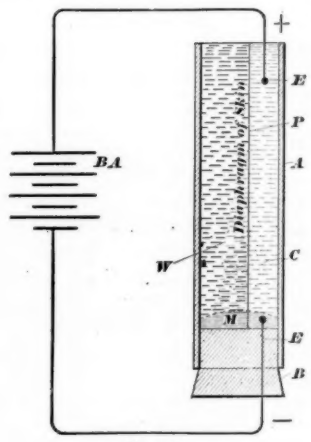


FIG. 4.

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ELECTRICITY FOR ENGINEERS, By *Desmond*

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REMEMBER: $15.00 buys all of the above, delivered to your office or residence.

KINDRED INTERESTS

Curtis & Curtis, Bridgeport, Conn., tell about their pipe cutting and threading machinery in a recently issued pamphlet.

The Reading, Pa., Electrical Construction Company has been organized. J. K. Righter will be the manager of the new concern.

The Ansonia Brass and Copper Company, 19 Cliff street, New York, has sent out a new catalogue and price list of Tobin bronze products. A number of very strong testimonials are included in the pamphlet.

The Central Electric Company, Chicago, report the sale of three underground cables of the Okonite manufacture within the past week. From the many proposals that are out, they expect to be busy in this department very shortly.

Merchant & Company, Philadelphia, have issued a reprint of a very interesting article which recently appeared in *Business* under the head of "The Advertising History of a Great House." It tells all about Merchant & Company's "brownies."

The Eureka Tempered Copper Company, North East, Pa., have recently received large orders from the Edison and Westinghouse companies aggregating over 200,000 castings. Their plant is crowded to its utmost capacity to keep pace with their orders.

The Short Electric Railway Co. announce recent sales to the Braddock Electric Railway Company, Braddock, Pa.; the Union Passenger Railway Company, Chester, Pa.; the Fort Wayne Electric Railway Company, Fort Wayne, Ind.; the Schuylkill Electric Railway Company, Pottsville, Pa.

The New Machine Shop for the Henry R. Worthington hydraulic works at South Brooklyn, N. Y., will be built of iron by the Berlin Iron Bridge Company, of East Berlin, Conn. The building is 200 feet long by 50 feet wide, with a 20 ton Sellers traveling crane. The building is made from the designs of the Berlin Company, who furnish it complete, including the foundations and brick work.

The Interior Conduit and Insulation Company, 42 and 44 Broad street, New York, do not confine their operations to this country alone, as their foreign agents are placing large and satisfactory orders all the time. Mr. Everett Frazer, of 124 Water street, New York, their agent for China and Japan, is shipping extensively to the above named countries. The Chinese and Japs are not behind the age, and evidently know a good thing when they see it.

It isn't often that we depart from the legitimate field of electricity to the discussion of subjects outside of the lines we have laid down for ourselves. Occasionally matters of general interest come up which require our attention, and we are glad to turn aside, from time to time, from the all-engrossing subject of electricity and electrical development. What confronts us now is the claim of the friend of every business man which is universally known as the Remington standard typewriter. This friend needs no introduction to our readers, and little can be said to add to its present popularity. We believe in the Remington, and the one before us now, on which these words are being prepared for publication, appears to realize this fact by the good-natured way in which it behaves while we speak its praises. It is an old and tried friend, to be sure, and gives better satisfaction day by day. Wyckoff, Seamans & Benedict, New York, are the people who are constantly at work with the best facilities for making the improvements which make the Remington typewriter what it is.

Electricity at the World's Fair.

It is to be hoped that no discord between the World's Fair managers and the electric light companies in regard to the cost of lighting the grounds will be allowed to interfere with the completeness of the general electrical exhibit.

If there is any field of modern invention and progress that can be called truly American it is the practical development of electricity. Here we outrank all other nations. American inventors and scientists have given to the world new uses for electricity that have revolutionized many spheres of human labor. They have perfected the telephone, the phonograph and the new transmitters used by telegraphers. In electric lighting and electric propulsion they have outstripped all competitors.

No World's Fair exhibit can compare in utilitarian interest to mankind with the electrical exhibit. A large portion of the intelligent public has come to believe that electricity is the force that will rule all spheres of human activity in the future. They are intensely interested in every new use to which the subtle agent has been put.—*Chicago News.*

FOR SALE—Ten horse-power Baxter Motor, nearly new; price, $400.

ERLANGER BROS.,
519 W. Pratt St., BALTIMORE, MD.

FOR SALE.

STEAM and hand Geisler pumps for sale, in good repair.

Apply to

GERMANIA ELECTRIC CO.,
Marlboro, Mass.

FOR SALE.

QUICK, FOR CASH—One 16 inch by 16 inch, latest type, 150 Horse-Power Ball Engine, has been in temporary use three months and is without scar or blemish, and so guaranteed by the makers and by ourselves.

J. W. PARKER & CO.,
38 South Fourth St., Philadelphia, Pa.
PHILADELPHIA AGENTS BALL ENGINE.

FOR SALE.

Two No. 20 500 volt Edison Railway Generators, 65 horse-power, complete, with regulating devices and in perfect working order, for $1,625 each.

Three No. 10 220 volt Edison Dynamos complete, with regulating devices and in perfect order, for $700 each.

One Hawkeye 220 volt dynamo 200 amperes for $500.

One Hawkeye 220 volt dynamo 150 amperes for $350.

Three Baldwin Steam Dummy Locomotives, from eight to eleven tons, two for $500 each—one good as new for $2,500, all of them were in daily use last summer.

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PART OF STORE on Fulton Street, adjoining new *Mail and Express* building, good light, steam heated, Edison wire in building. Space about 750 square feet.

Inquire at 170 FULTON STREET.

BIDS FOR PUBLIC LIGHTING.

One, three and five year bids for lighting the streets and city buildings of the City of Burlington, Iowa, with sixty (60) or more arc lights of 2,000 candle-power each, and 250 or more incandescent lights of 20 or more candle-power each, will be received at the office of the City Clerk until April 18, 1892.

All bids to be accompanied by a good and sufficient bond in the sum of $5,000 for the faithful performance of the bid.

The Council reserves the right to reject any or all bids.

HENRY RITTER,
Chairman of Gas Committee.

Robb MacKie,
CONSULTING ELECTRICAL ENGINEER,
Neave Building,
CINCINNATI, O.

OFFICE OF THE LIGHT-HOUSE ENGINEER, THIRD DISTRICT.
TOMPKINSVILLE, N. Y., March 28, 1892.

SEALED PROPOSALS will be received at this office until 12 o'clock M., Monday, the 25th day of April, 1892, for furnishing Miscellaneous Articles for the Light-House Establishment. The articles needed consist of twenty numbered lots, embracing, respectively, Charcoal and Cumberland Coal; Building Material; Engineers' Supplies; Hardware, Tools, etc.; Iron and Steel; Belting; Graphite Paints, etc.; Lumber; Boiler Covering; Plate Glass; Galvanized and Russia Sheet Iron, Tin, Solder, Sheet Zinc and Iron Wire; Sheet Brass and Copper; Composition, Brass and Nickel Castings; Bells; Acids; Iron Castings; Sheet-Iron Smokestacks for Boilers; Electro-plating Supplies; Shooks for Oil Supply-Boxes; and Miscellaneous Articles; all of which are enumerated in the specifications attached to the form of bid, which may be obtained on application to this office. Samples may be seen or information obtained at this office concerning any article not sufficiently described in the specifications. Bids will be received for one or more numbered lots complete. Envelopes containing proposals should be indorsed "Proposals for Miscellaneous Articles." The right is reserved to reject any or all bids, to strike out any item or items in the specifications, and to waive any defects. Bidders are invited to be present at the opening of proposals. D. P. HEAP, *Major of Engineers, U. S. A., Engineer Third Light-House District.*

Put up in One Pound Cans. Price, 70 Cents per Pound.

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Patentees and Sole Manufacturers
Perforated Electric Leather Belting
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Planers, 16 in. x 16 in. x 3 ft.; 20 in. x 20 in. x 4 ft.; 24 in. x 24 in. x 6 ft.; 30 in. x 30 in. x 6 ft.; 36 in. x 36 in. x 10 ft.; 42 in. x 42 in. x 12 ft.; 72 in. x 60 in. x 15 ft.; 72 in. x 60 in. x 20 ft.
Friction Shapers, 15 in., 16 in., 20 in., 22 in., 32 in.
Crank Shapers, 6 in., 8 in., 10 in., 12 in., 15 in., 16 in., 20 in., 24 in., 28 in.
Screw Machines, Nos. 1, 2, 3, 4, with or without Wire Feed.
Screw Machines, Nos. 5, 6, 7, 8, Power Feed.
Presses, Nos. 51, 52, 53, Ferracute, Nos. 1, 2, 3, Stiles & Parker.
5 Lincoln Pattern Millers, No. 2.
Hand Millers, Nos. 1 and 2. 3 Cam Cutters.
Bolt Cutters, ¼ in. to 1 in., ½ in. to 2 in.
2 Profiling Machines. 1 36 in. and 48 in. Gear Cutter.
C. D. and E. Horizontal Boring Machine. Newark Machine Tool Co.

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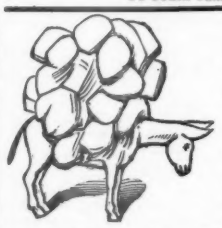

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ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON MARCH 16, 1892.

471,302 Safety device for electrical conductors; Julius Marx, Manheim, Germany.
471,310 Long distance telephone system; Eugene Gwosdeff, St. Petersburg, Russia.
471,352 Telephone system; Anthony B. Ferdinand, Oshkosh, Wis.
471,375 Conduit for electric railways; Francis O. Blackwell, Boston, Mass., assignor to the Thomson-Houston Electric Co. of Connecticut.
471,409 Apparatus for electric railway signaling.
471,410 Electric railway signaling apparatus; Adoniram J. Wilson, Port Chester, N. Y., assignor to the Hall Signal Co., of Maine.
471,447 Charging table for electric railways; Edward P. Usher, Grafton, Mass.
471,454 Process of and apparatus for bleaching by electrolysis; Albert E. Woolf, New York, N. Y., assignor, by mesne assignments, to Rosamond Woolf and Thomas J. Montgomery, same place.
471,491 Trolley wire hanger; Thomas J. McTighe, New York, N. Y.
471,525 Automatic electric block system; Joseph A. Carlton and Henry L. Johnston, Atlanta, Ga.
471,526 Disk carbon for arc lamps; Hosea W. Libbey, Boston, Mass.
471,527 Machine for casting grids for secondary batteries; Albert F. Madden, Newark, N. J., assignor, by direct and mesne assignments, to John M. Pendleton, New Brighton, N. Y.

MARCH 23, 1892.

471,534 System for transmitting signals; Henry A. Chase, Boston, Mass., assignor to Albert Watts, same place.
471,535 Telephone receiver; James A. Christy and Elias J. Baldwin, San Francisco, Cal.
471,538 Storage battery plate and process of making the same; William W. Donaldson and Roderick Macrae, Baltimore, Md.
471,543 Electric railway; William C. Goss, Lynn, Mass.
471,549 Attachment for telephones; James E. Hills, New York, N. Y.
471,564 Current motor; Lemuel C. Neal, Lewiston, Idaho.
471,576 Manufacture of incandescent electric lamps; Frank S. Smith, Pittsburgh, Pa.
471,587 471,588 Insulated electric conductor; James B. Williams, Oakland, Cal.
471,590 471,592 Secondary battery. 471,591 Secondary battery electrode; Charles F. Winkler, Troy, N. Y.
471,612 Electric switch; Harvey Hubbell, Bridgeport, Conn.
471,625 Joint for electric wires; Roger H. Smith, Lexington, Ky.
471,626 Foot support for telegraph poles; Emma A. Streeter, White Plains, N. Y.
471,645 Support for electric lamps; Charles J. Klein, New York, N. Y.
471,655 471,656 Device for transmitting motion; George S. Strong, New York, N. Y., assignor to James N. Gamble, Cincinnati, Ohio.
471,691 Dynamo electric generator or motor; Claude W. Atkinson and Llewelyn B. Atkinson, London, England.
471,693 Dynamo electric machine or motor; Walter S. Goolden and Llewelyn B. Atkinson, London, England.
471,720 Mast arm switch for electric lamps; Thomas Dillon, Indianapolis, Ind., assignor of one-half to John Caven, same place.
471,732 Bracket for incandescent electric lamps, John H. Goehst, Chicago, Ill.
471,745 Telephone; James H. Howard, Medford, Mass.
471,750 Safety attachment for cable or electric cars; Albert Raynal, New York, N. Y.
471,759 Pole for supporting electric wires; John H. Huntress, Janesville, Wis.
471,760 Electric switch; Charles G. Perkins, Hartford, Conn.
471,790 Electric telpherage apparatus; Midbury W. Hassam, Rochester, N. Y.
471,792 Commutator brush; Robert Hirsch, Milwaukee, Wis., assignor of one-half to Herman Menninger, same place.
471,812 Power transmission; John F. Devold and Gustav Monrath, Chicago, Ill.; Theodore Devold and Olaf E. Ray, administrators of said John F. Devold, deceased.
471,819 Brush holder for electric motors or dynamo-electric machines; Charles A. Hussey, New York, N. Y.
471,837 Support for electric lights; James J. Walsh, Paris, Tex.
471,850 Electro-therapeutic electrode; Harry Bouis, Blanchard, Ontario, Canada.
471,913 Electric lock; James G. Thompson, Boston, Mass.
471,929 Automatic electric fire alarm; Leonidas G. Woolley, Grand Rapids, Mich.
471,945 Galvanic battery; William Burnley, North East, Pa.
471,947 Electrically controlled trap door; Frank C. Callahan, Bridgeport, Conn., assignor of one-half to Jacob B. Klein, same place.
471,968 Electric light crane; James Gallagher, Oakland, Cal., assignor of one-half to John A. Britton, same place.
471,986 471,987 Electrical annunciator; Nelson M. Watson, Detroit, Mich., assignor of three-fourths to Alfred H. Heath, William B. Heath and Sarah A. Millard, same place.
471,993 Reciprocating snap switch; Jacob S. Gibbs, Hartford, Conn., assignor to the Perkins Electric Switch Manufacturing Company, of Connecticut.
471,997 Automatic electric cut-out; Edward A. Manship, Minneapolis, Minn.
472,019 Method of and apparatus for producing musical tones by electro-magnetism; Eli C. Ohmart, Detroit, Mich., assignor to Melvin L. Levery, Boston, Mass.

JOHN A. BARRETT,
ELECTRICAL ENGINEER & EXPERT,
13 PARK ROW,
Room 28. NEW YORK.